
Continuing the Mission
U.S. Army Corps of Engineers
A History of the New York District
1975-2005
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COL T.C. Hunter, Jr.
1974-1977

COL Clark H. Benn
1977-1980

COL Walter M. Smith, Jr.
1980-1983

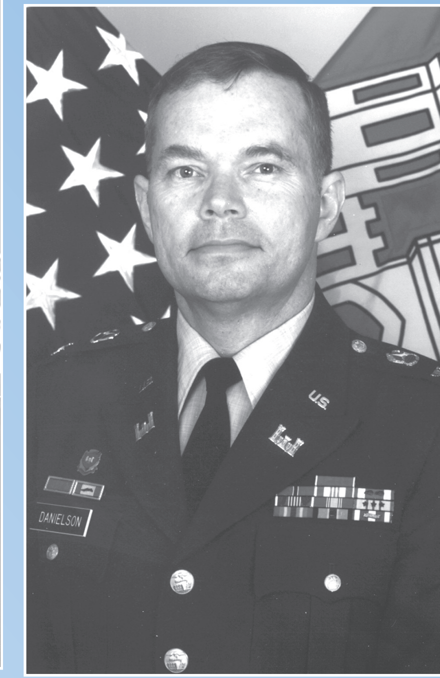
COL Thomas A. York
1992-1995

COL Gary Thomas
1995-1998

COL William H. Pearce
1998-2001

COL F.H. Griffis
1983-1986

COL M.L. Calwell, Jr.
1986-1989



COL R.M. Danielson
1989-1992

COL John B. O’Dowd
2001-2004

COL Richard J. Polo, Jr.
2004-2006

COL Aniello L. Tortora
2006-2009

Continuing the Mission

U.S. ARMY CORPS OF ENGINEERS

A HISTORY OF THE NEW YORK DISTRICT

1975-2005

Written by

Howard L. Green

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Dedication Letter

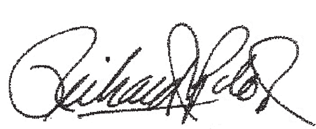
We have always taken pride that the U.S. Army Corps of Engineers balances continuity and change. The Corps of Engineers is almost as old as the nation and, like the nation, it has changed a great deal over the centuries without abandoning its central mission. As the United States evolves, the U.S. Army Corps of Engineers adapts to meet the changing needs of new times. The Corps of Engineers remains as integral to national development today as ever, and it will remain an important tool of national policy at home and abroad for the foreseeable future. If you scratch the surface of just about every important public works project in the country, you find the Corps of Engineers under it somewhere.

Recent events illustrate why the Corps will remain a key element of national policy, in war and in peace. Wars today must be fought with post-war reconstruction as a strategic aim. Reconstruction without infrastructure is inconceivable, and where there is infrastructure to be rebuilt the Corps of Engineers will be required to do it. Similarly at home, while one can hope we do not soon see another disaster on the scale of the devastation of the Gulf Coast in the summer of 2005, it is certain that disasters will befall us. By supplying skilled volunteers for emergency relief efforts, partnering with the Federal Emergency Management Agency and its parent Department of Homeland Security, and coordinating cleanup efforts, the Corps demonstrates its usefulness. Moreover, after major storm events, a debate follows over what to build; and when a decision on what to build is reached, the Corps of Engineers will design and construct it.

Just as the Army Corps of Engineers is integral to the nation, the New York District is essential to its region. We play a vital role in the economy of greater New York, and in support of the military presence in the Northeast. While the offices of the New York District were not located in the World Trade Center, they were nearby. The district was declared a victim district after September 11, 2001, but the un-victim like manner in which it functioned inspires me whenever I hear about it. After the attack district personnel got themselves to safety and accounted for one another expeditiously. Boat crews from Caven Point ferried survivors from Lower

Manhattan to safety, and they provided fuel for the fire boats, springing into operation before anyone was in a position to give instructions. District personnel assisted with the cleanup of Ground Zero, and they designed the system for sorting debris after the operation was moved to Staten Island. Meanwhile, the district staff moved in with the North Atlantic Division Headquarters at Fort Hamilton and managed to complete the end-of-fiscal year contract work despite the traumatic circumstances. This story reminds us of two things. One, I have already mentioned: the Corps of Engineers is and will remain essential to the nation. The other is that this district, like Corps districts and divisions around the world, is staffed by talented, dedicated, and hard-working people. The Corps will endure because of the contributions its employees make.

If the future is so bright, why does the district need an update to its history book? That is like asking why does the future need a past, or why does a person need a memory. It is because the future of the Corps of Engineers is secure that we need to know its recent history. If we do not know what we did and why we did it, how can we move forward? If we cannot face our mistakes, how can we learn to do better? If we don't know about our successes, how can we build on them? The history of a diminishing agency is for the archives. This recent history of our ongoing, vibrant enterprise comprises a reference that all who are touched by the work of the New York District will be referring to often.



Colonel Richard J. Polo, Jr.

Commander, U.S. Army Corps of Engineers, New York District

(June 3, 2004 – August 25, 2006)

New York City

August 24, 2006

Foreword

The U.S. Army Corps of Engineers was founded in the Empire State. That is why we call the New York District "The Cradle of the Corps." The New York District has, since the early days of our nation, maintained a tradition of being ready, willing and able to build … and to build strong. This book brings to life the significant accomplishments of the district over the past quarter century and its recent tremendous support to the Global War on Terror and disaster relief. This book also sets the stage for the future, not just for the district, but for the Corps of Engineers and our country.

The most consequential events to date of the twenty-first century - the attacks on September 11, 2001 and the natural catastrophe of Hurricane Katrina — are stark reminders to all of us that infrastructure and national security are very much one and the same. This district witnessed first hand the events of 9/11 and district personnel responded in heroic fashion in support of New York and its citizens. We have entered an era of persistent global conflict and the demands being placed on our Corps and the district are substantial. Despite these demands, we rise to the challenge knowing that we must succeed.

The work we are doing in our region contributes directly and significantly to the nation's economic strength and to the ability of our Armed Forces to execute its mission. Our nation is at war and our Army has been fighting and transforming. We are building a modern force to meet strategic demands and operational requirements. As part of this transformation, the Corps of Engineers has taken on one of the largest construction missions in history. We are building "sustainable installations" and the facilities to house soldiers and their families as well as the critical civil works infrastructure to protect Americans and strengthen our nation.

As soldiers and as civilian-members, we in the U.S. Army Corps of Engineers have been given a very special mission: to create, maintain, and safeguard the infrastructure that makes America work. It is a mission that represents a special contract with the American people. It is a mission that involves an enormous degree of competence, trust and integrity. It is a mission that requires our utmost dedication and resourcefulness. I am proud to say that the district has stepped up to this mission and - as this book describes - we are delivering!

This book clearly emphasizes that the greatest asset we have in fulfilling our mission is our people. Our dedicated teammates are ever vigilant, with an incredible sense of honor, loyalty and pride. The world may have viewed New Yorkers differently after September 11, 2001 but, at the district, our team's selflessness and patriotism have always been present. The district's commitment does not stop at America's shores. District personnel continue to readily volunteer, showing incredible personal courage to serve in troubled areas of the world in support of the Global War on Terror. District personnel also volunteer to support our fellow Americans when natural disasters strike our homeland. These are dedicated professionals, from all walks of life, working to meet the needs of our nation with dignity, respect, and professionalism. The men and women of the district epitomize what it is to be a public servant and symbolize the best of being Army Strong!

Army Strong, Engineer Ready! Building Strong! That is, at its essence, the New York District as we attack the challenges of the next twenty-five years. I am proud and honored to serve as the District Commander.

Essayons,

Colonel Aniello (Nello) Tortora

Acknowledgements

Updating the history of the New York District to cover the period 1975 to 2005 was a challenging task. It extended far beyond the writing of the book, and ultimately encompassed thousands of hours of "behind the scenes" activity. This supporting effort, provided by many district personnel (current and retired), greatly informed and enhanced the text, enabling the production of a detailed and multidimensional book.

The project began at the direction of the preceding district engineer of the New York District, Colonel Richard J. Polo, Jr. Without Colonel Polo's enthusiasm and drive to document the recent history of the New York District, this project would never have seen the light of day. The endeavor was completed under the direction and authorization of the current district engineer, Colonel Aniello L. Tortora.

The Project Delivery Team (PDT) comprised: Carissa Scarpa, Project Manager; Roselle Henn, Team Leader; Lou Benard; Joanne Castagna; Vincent Perrera; Christopher Ricciardi; Gustavo Sierra-Gonzalez; and Kenneth Wells. Leonard Houston, Chief of the Environmental Analysis Branch, provided extraordinary and knowledgeable support and assistance throughout the researching, writing, and editing of this book.

The Quality Assurance/Quality Control (QA/QC) Team comprised: Eugene Brickman; Susan Hopkins; Wardwell Leo; Stuart Piken; Peter Shugert; John Tavolaro; and Samuel Tosi. Members of the QA/QC Team were tremendously valuable in bringing their institutional knowledge to the project. They attended numerous meetings, sitting and discussing topics and issues with the PDT, and read countless versions of the drafts to help guide the PDT throughout the project.

John Lonnquest, Chief, Office of History, Headquarters, U.S. Army Corps of Engineers (USACE), deserves special thanks for his critical reviews of the book in draft form and for his assistance in identifying sources of research material. The overall support of Paul Walker, former Chief of the Office of History, in updating district histories is also noted with appreciation.

Research for this project was undertaken at the following locations: the Office of History's research collections in Alexandria, Virginia and the National Archives in Washington, D.C.; the USACE Engineer Research and Development Center's library in Vicksburg, Mississippi; Picatinny Arsenal in New Jersey; the New York Public Library; the North Atlantic Division, USACE, in Fort Hamilton, New York; and the New York District headquarters in New York City. The various staff members at these institutions deserve a round of thanks for their professionalism and continued assistance.

As part of the overall research process a number of former district engineers and current and former personnel were interviewed. These individuals provided the PDT with abundant information and insights otherwise unavailable in written documents. The interviewees were: Eugene Brickman; Arthur Connolly; Thomas Creamer; James Demetriou; Leonard Houston; Dominick Passantino; Stuart Piken; Louis Pinata; Michael Rovi; Frank Santomauro; William Slezak; and Samuel Tosi.

In addition to the PDT and QA/QC team members and the interviewees identified above, several other current and former USACE individuals supplied important feedback following their review of the various iterations of the text. This "extended" review team included: Colonel M.L. Caldwell, Jr.; Colonel R. M. Danielson; Colonel John B. O'Dowd; Colonel Gary Thomas; Joseph Forcina; Joseph Hirschy; Clifford Jones; Lorraine Lee; Lawrence Mazzola; Gilbert Nercessian; Joseph Seebode; Paul Tumminello; and Steven Weinberg.

A full list of New York District staff who dedicated time and energy to ensuring that this book gives an accurate depiction of the district's history in the period 1975-2005 is so long that it would be impractical to include it here. As a group, the district staff displayed exceptional generosity providing the PDT with everything from background information, ideas, and opinions to written and oral comments on portions of the manuscript. Many of the illustrations scattered throughout the book were kindly supplied by district staff who are too numerous to name individually here. We thank everyone in the district for their material assistance, support, and interest in this project.

The research, interviewing, and writing undertaken for this book were principally carried out by Howard L. Green, Historian, working as a subcontractor to Hunter Research, Inc., in turn subcontracted to Northern Ecological Associates, Inc. Editing, graphic design, indexing and final production were conducted by Richard Hunter, Michael Murphy, Marjan Osman and Patricia Madrigal of Hunter Research

Project Delivery Team

New York District

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Prologue

This book is a history of the New York District of the U.S. Army Corps of Engineers during the last thirty years. Throughout these decades the district proved itself to be a flexible and adaptive organization. Everything about the district follows from its commitment — stated and restated mantra-like in its offices and cubicles — to deliver a quality product on time and within budget. The Corps of Engineers aims to deliver its services as expeditiously and economically as possible. This is true whether the agencies that use these services are military or civilian, and whether the product is a base for a new infantry division, an athletic center at a service academy, or a highly technical engineering or environmental analysis.

The last three decades have seen a lot of change, but the biggest development, in terms of impact on the Corps of Engineers, has been the rising level of environmental consciousness among the American people. Beginning for the most part in the 1960s Americans began adding environmental management to the functions they asked government to provide. As part of this development, the Corps of Engineers soon took its place alongside other federal agencies seeking to preserve, restore, or improve the natural environment, control pollution, protect wildlife habitats, manage waste responsibly, and so forth. Environmentalism affected the Corps' civilian works more deeply than its military works. But the American military reflects the society of which it is a part, and the Pentagon developed environmental programs along with the rest of the nation. As the military grew greener the Corps of Engineers' military mission followed suit.

At the same time that the Corps of Engineers began to work with the Environmental Protection Agency, the Fish and Wildlife Service, and other agencies of the federal environmental bureaucracy, it remained different from them. Unlike most of these other agencies, which were primarily focused on regulation and resource protection, the Corps of Engineers was responsible for developing and managing water resources and infrastructure. In the New York District, as elsewhere in the Corps, environmental projects and programs such as hazardous waste cleanup were added to the district's customary responsibilities of building military facilities, reducing the damaging effects of floods, deepening navigation channels, stabilizing beaches, and so on.

The Corps of Engineers sometimes took on complex and large-scale cleanup and remediation projects beyond the scope of these other agencies, while, at the direction of Congress it continued to move soil and build hard structures in the promotion of economic growth and military improvements. Eventually a new mission in ecosystem restoration was added to the district's workload, leading to new programs and projects to protect and preserve America's natural bounty.

The New York District's adaptation to the nation's new environmentally sensitive milieu manifested itself in two ways. In the mid-1970s the district was an organization that mostly maintained or deepened federal navigation channels, issued permits for the projects of others on, in, or near these channels, planned and built flood control and storm damage protection projects, and expanded and improved military facilities. Its primary working relationships were with Congress, the Department of Defense, state and local governments, the shipping industry, and the engineering and construction industries. When the National Environmental Policy Act of 1969 made the Corps of Engineers' decision-making process more transparent, it had the effect of bringing more diverse viewpoints to bear on the district's projects and regulatory decisions.

District projects have for many years been presented to the public at hearings. However, in the 1970s, the district broadened the spectrum of stakeholders with whom it discussed project plans as they were being formulated. By the early 1980s the district was recognizing that it had many constituencies who were often in disagreement with one another. In the New York-New Jersey harbor, for example, the Port Authority of New York and New Jersey, the shipping industry, longshoremen, commercial and recreational fishing concerns, sail and power boaters, divers, tourists, bird watchers, clean water advocates, and others all had different opinions on the appropriate uses of this body of water. Finding it difficult to get support for a plan for disposal of material dredged from the navigation channels, the district established a Public Involvement Coordinating Group to bring as many interested parties as possible into the effort to find consensus. In a similar vein, in the late 1980s the district worked to broker a plan for the Hackensack Meadowlands in New Jersey, with which developers and environmentalists could all agree. By the end of the decade it was clear that the various water resources over which the district exercised some authority — harbors, bays, and coastlines, for example — often had constituencies that were inevitably at odds. The effort to resolve competing claims over these resources is a hallmark of the era of environmentalism and it became an increasingly large part of the work of the district. As the years wore on, reconciling opposing views took a place alongside solving technical problems in the district's toolkit.

The second manifestation of the New York District's response to environmentalism grew out of the first. Entrusted with potentially conflicting missions, and recognizing the multiplicity of concerns it was dealing with, the Corps of Engineers developed "a sustainability ethic," which emphasized balance among "environmental, economic, and social factors." In 1999 a New York District document on the disposal of materials dredged from the New York-New Jersey harbor expressed it this way:

The Port does not exist on its own, but within the confines of the estuary. The estuary with its diverse natural resources is invaluable to the region. To maintain or enhance one without the other is unacceptable. Just as the economic goal is to maximize and expand the use of the Port, the environmental goal is to maintain and enhance the estuary in which the Port is located.

This emerging duality and the Corps of Engineers' effort to find a way to bridge the gap between its missions are the keys to the recent history of the New York District. The district did not find a balance overnight, although the transformation was well under way by the late 1980s. The district's huge Fort Drum project included an environmentally efficient co-generation power plant, and around the same time Congress gave the Corps of Engineers responsibility for the Defense Environmental Restoration Program, through which it cleans up hazardous and toxic waste sites at formerly used defense sites. The Army adopted a four-point environmental program in 1993, important elements of which went to the Corps for implementation. Symbolizing the increasing involvement of the Corps of Engineers in the Army's environmental mission, in 1997 Congress gave the Formerly Used Sites Remediation Action Program to the Corps. This program, under which the district has five projects, cleans up low-level radioactive contamination at sites associated with the early years of the atomic energy program.

Today the district's portfolio of work features many environmental projects ranging from individual sites to entire watersheds, and nationally the Corps has formalized a set of "Environmental Operating Principles," designed to ensure that "conservation, environmental preservation and restoration" are considered "in all Corps activities." The New York District is greener than it was in the early years of the environmental era, when this narrative begins, and that is an organizing theme of this book. But it is not the whole story. The district's story has another context too: the distinctive character of the ecologically diverse, heavily developed, and densely populated region it serves. The New York District includes the most heavily populated coastal region in the country. Roughly twenty million people live within fifty miles of the district's shores. The New York-New Jersey harbor, one of the most intricate natural harbors in the world, was the busiest port (in terms of tonnage) in the nation in the mid-1970s, and remains among the busiest few. The district's political complexity mirrors the density of its population. The civil boundaries include pieces of five states, which are represented in Congress by eight senators and thirty-eight representatives, and the military boundaries for most of this period were even larger, stretching to include all of New England. In the New York metropolitan area comparatively simple technical problems can be difficult to solve because of the complicated politics of the region.

All federal agencies are unique, but the U.S. Army Corps of Engineers is unique in the executive branch for a number of reasons. It is a largely civilian organization with military leadership. The Corps of Engineers also has civil and military projects and programs, with funding for its civil activities being received from Congress on a project-by-project basis. These and other realities of the Corps of Engineers have shaped the recent history of the New York District. But ultimately the history of the New York District since 1975 is a story of the people who came together and contributed their talents to make the district an organization that could assimilate new missions and invite more people into the effort to resolve issues and solve the problems of the era of environmentalism.

Note: Throughout this book dollar amounts are those quoted by the New York District and other sources for the then current year.

The Geography
of the
New York District

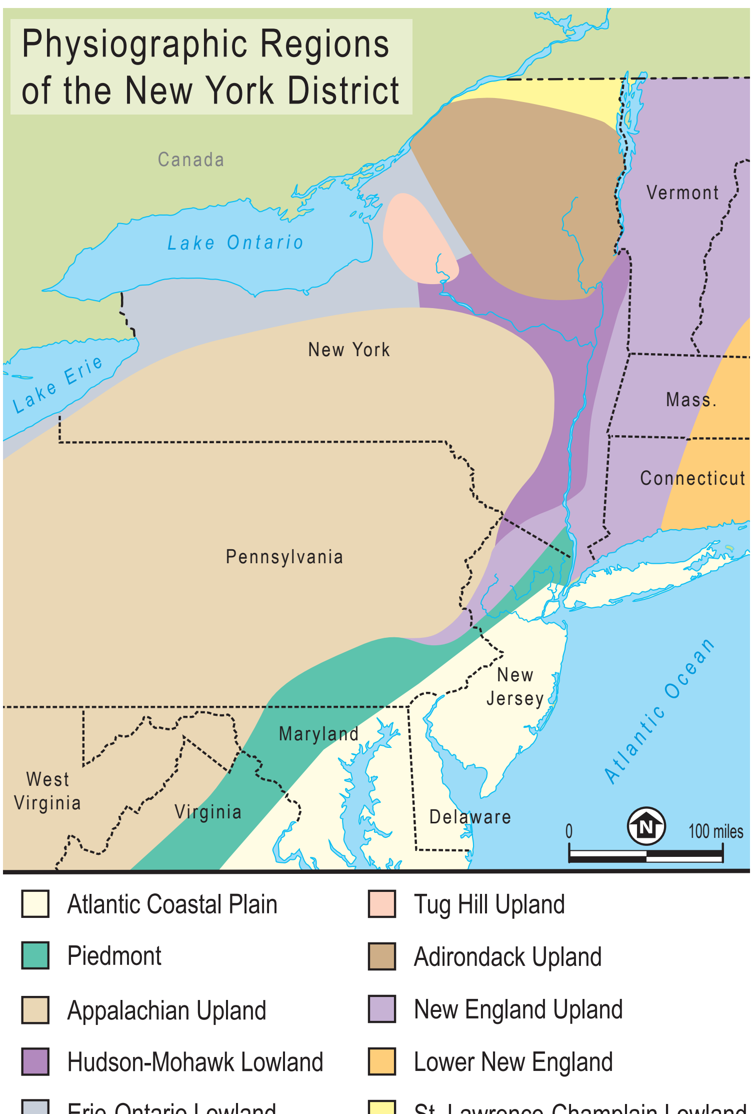
On some level all the work of the New York District — civil works projects and military construction alike — involves managing the restless surface of the earth: water, sand, and soil that move according to their own natural laws. Native Americans and early European settlers in the region coped with the variable weather, adapted to the ecosystems in which they lived, and faced erosion and flood problems. These challenges have only grown more complex as the area has become more and more densely populated in modern times.

Since the landscape of virtually all the district's territory was shaped by the last glacier to cover the area, a little background on this fundamental happening is germane. During the Ice Age a sheet of ice that covered all of northern North America twice reached the latitude of New York Harbor and Long Island. From Perth Amboy in central New Jersey, the southernmost point of the Wisconsin ice sheet's final advance, a terminal moraine angled northeast, forming the spine of Long Island. To the northwest the moraine followed an irregular line from Perth Amboy to Summit, Madison, and Morristown and then approximately traced the path of modern Interstate Route 80 across western New Jersey. In places the ice sheet was as much as two miles thick.

Between 20,000 and 10,000 years ago the ice began to melt. In its advance and retreat, the ice scoured the underlying land surface. It carved the bedrock, relocated river beds, chiseled gorges, and gouged out ponds. An enormous jumble of sand, clay, gravel, and boulders, collectively referred to as till, was picked up, mixed up, transported and re-deposited. Under the titanic force of the moving ice sheet the till affixed itself to the sculpted and eroded bedrock surface, much of it remaining behind when the ice retreated for the last time. The discontinuous sheet of mostly clay, silt, and gravel mantling the bedrock supplies much of the district's topography as we know it today.

Glacial and periglacial action left the region with many of its characteristic features. In valleys where streams drained away from the steep face of the ice, meltwater flowing briskly from the glacier tended to stratify the till by size. The larger material was left closer to the retreating glacier, while successively smaller matter was carried farther away. Deposits of clay, silt, and sand were thus laid down toward the middle of a valley while coarser-grained deposits terraced the sides. If a lake temporarily formed in a valley, clay, silt, and fine sand were deposited on its bottom. When ice left the valley the streams it left behind began their own work of redistributing glacial deposits. Today, alluvium in the river valleys consists primarily of re-deposited glacial silt and gravel. More permanent lakes were formed where streams drained toward rather than away from the ice, or when sediments flowing away from the glacier formed a dam.

Along lowland parts of the coast, the immense weight of the ice sheet pushed the land below the level of the sea. The ocean advanced as the ice retreated, and marsh and swampy wetlands formed when marine clay and silt were deposited over glacial till as in much of northeastern New Jersey. Glaciers generally left their deepest deposits of material at their moraines, creating ridges of unconsolidated rock. The backbones of Long Island and Staten Island were formed in this way. Their southern shores consist of the gravel, sand, and mud that washed out of the hilly moraines as the ice melted away.



With this glimpse of the district's recent geological history a closer look at its physical nature, starting again in the north, is now possible. Lake Champlain and its smaller neighbor to the south, Lake George, are part of a great band of large glacial lakes that includes the Great Lakes. Lake Champlain is, after the Great Lakes, the largest lake in North America. The Champlain Valley frames the eastern and northern sides of the Adirondack Mountains. To the north it tends to be sandy and unproductive. On the east it marks the western edge of Vermont's Green Mountains. The U-shaped fertile interior of the north-south valley is typical of the New England Uplands which extend east to the Atlantic coast.

The Adirondack Mountains, which contain the highest mountains and most rugged terrain in the district, include tens of thousands of miles of rivers and streams; they have hundreds of peaks and foothills and more than forty summits rise above 4,000 feet. The Adirondacks are generally covered by coniferous forest with scattered hardwoods also common on the lower slopes, the terrain in which the district built Fort Drum.

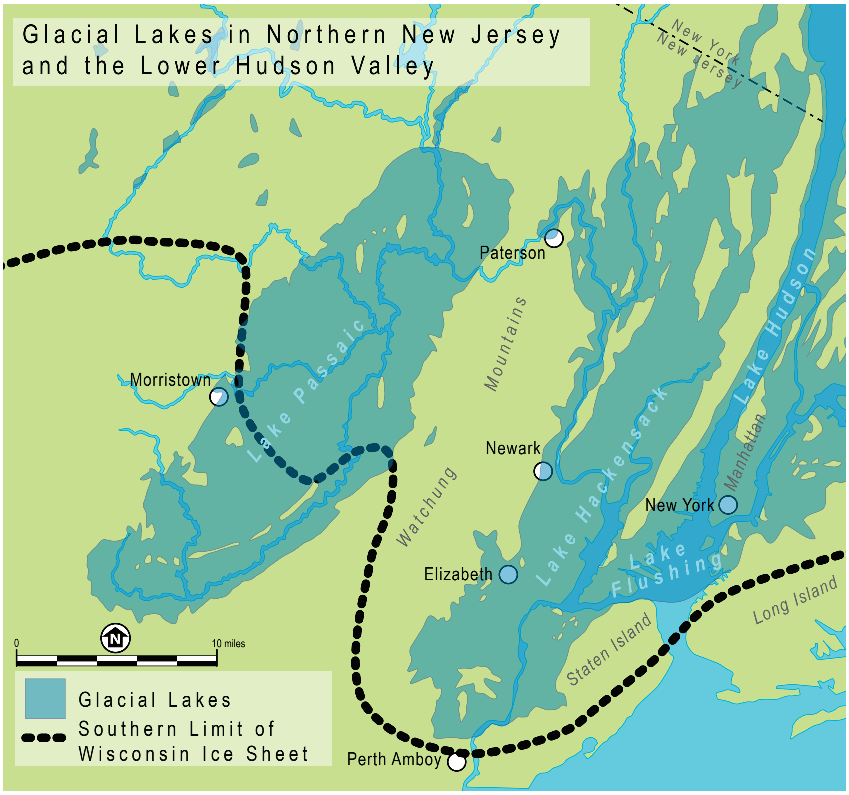
To the south of the Adirondacks and separating them from the Catskill Mountains is the Mohawk Valley, which formed when the St. Lawrence outlet for the glacial Great Lakes was blocked by ice. As water from the meltwater-engorged lakes needed to find a way east to the Atlantic it opened a seam toward the Hudson. East of the Adirondacks, the Champlain Valley converges with two smaller fertile valleys, the Vermont and the Hudson, with the Taconic Mountains thrusting between them. The Valley of Vermont is a small section of land between the Green Mountains and the Taconic Mountains. The Hudson Valley follows its namesake river from just north of Albany to New York City where its waters eventually reach the Atlantic Ocean. Compressed between the Catskill and Taconic ranges, the Hudson Valley is generally between ten and twenty miles wide along its entire 150-mile length.

The Catskill and Taconic Mountains, along with the Hudson River flowing between them, and the New York-New Jersey Highlands to their southwest actually form part of a 900-mile-long belt of roughly parallel geological formations known as the Appalachian Ridge and Valley. Extending from New York State to Alabama, this physiographic region consists of a narrow belt of sinuous ridges and interconnected valleys in a terrain that looks somewhat like the wrinkles in a kicked-up area rug.

To the east of the Appalachian Ridge and Valley, the district includes a portion of the New England Upland. This is a plateau intermittently dissected by narrow valleys that rises gradually from the Atlantic coast (outside the district) until it is surmounted by the Green Mountains in Vermont, the Taconics in the eastern Hudson Valley, and the White Mountains in New Hampshire. Two arms, or prongs, of the New England Upland extend southwestward across the district. One, the Manhattan Prong, a landscape of rolling hills and valleys, terminates at the southern tip of Manhattan Island. The other, the Reading Prong, is more commonly known regionally as the New York-New Jersey Highlands. The hills and valleys that make up these highlands are part of a relatively long and narrow geological feature that extends in a southwest-northeast trending direction from southeastern Pennsylvania near Reading, to southwestern Connecticut in the vicinity of Danbury. The Hudson River cuts a deep gorge through these highlands, roughly between Newburgh and Peekskill. The Highlands also include the rugged hills known locally as the Ramapo Mountains.

Snake Hill in Laurel Hill Park, Secaucus, New Jersey, viewed from the Hackensack River [New Jersey Meadowlands Commission]

Southeast of the Reading Prong is a relatively low-lying, gently rolling surface of broad valleys and small hills that slopes gradually in a southeastward direction from the hillier elevations in northeastern New Jersey to sea level at Newark Bay. This ten-mile-wide region, which generally has fertile, arable soils, is part of the Piedmont Province; by and large it slopes downward from the Appalachian Mountains to the Coastal Plain. In this area the Piedmont is intermittently interrupted by erosion-resistant formations that include the Palisades scarp along the west bank of the Hudson River, the ridges of New Jersey's Watchung Mountains, and Snake Hill in the Hackensack Meadowlands. Another conspicuous Piedmont landscape feature is two great marshes – the Passaic Meadows or Great Swamp and the Hackensack Meadowlands – both formed by the curious mechanics of the retreating ice. These marshes are the relics of two great glacial lakes formed when the Passaic and Hackensack rivers, respectively, became blocked by ice. As the Wisconsin ice sheet slowly receded the water in the lakes gradually drained to the sea and the cavities they had occupied took on clay, sand, gravel, and, most recently, peat from the marshes that had grown in them.



The journey from north to south through the district's region concludes on a large seaward-sloping flatland that ultimately stretches well beyond its boundaries, from Cape Cod south along the eastern seaboard to Mexico. The Atlantic Coastal Plain, as it is known, occupies the entire coastal section of the district, except in the immediate vicinity of New York City. Most of the plain consists of marine sands, clays, gravels, and marl and lies within one hundred feet of sea level. Climatically, this area is strongly influenced by the ocean and is thus cooler in summer and warmer in winter than the more interior areas of the New York Bight watershed.

In New Jersey, the Coastal Plain may be subdivided into geographically distinct inner and outer plains. The much narrower Inner Coastal Plain drains north into Raritan Bay, while the Outer Coastal Plain, lying adjacent to the Atlantic Ocean, drains directly into the New York Bight or into the back barrier coastal lagoons along the New Jersey shore. The Inner Coastal Plain has a larger proportion of clay in its soil and is fertile and agriculturally productive, while the Outer Plain is sandier, and comparatively infertile. Unlike coastal New Jersey, the surface of Long Island is covered by glacial material. Its topography slopes gently southward from the middle and northern portions of the island into an outwash plain of sands and gravels that reaches the shore.

A section of the barrier beach in Westhampton, Long Island, New York

Along both the Long Island and New Jersey Atlantic coasts there is an extended ribbon of barrier beaches, spits, and islands that is sporadically broken by tidal inlets. This strip is typically separated from the mainland by a back-barrier lagoon, a marsh system, or some combination of the two. On Long Island, Montauk Point at the eastern end serves as the headland source of the beach sands for the system of bars and islands that parallels the shore for nearly three quarters of the length of the island. Eroded glacial sediments are carried westward from Montauk Point in the coastwise, or littoral, current and deposited by wave action on the barrier beaches and offshore bars. In addition to the westward growth and movement of the beaches on Long Island, there is also a landward migration of this system in response to diminishing sediment supply and relative sea level rise.

In New Jersey eroded materials from the Atlantic Highlands in Monmouth County serve as the primary headland source of sand for the beaches along the Atlantic coast. They are swept in the littoral current northward to form the Sandy Hook peninsula, and southward to form the greater part of the barrier beach system of the Jersey Shore. As on Long Island, New Jersey beaches are migrating landward in response to a global rise in sea level.

From east to west, the barrier beach system of the south shore of Long Island has three subareas: the mainland-fronting beach area from Montauk to Southampton; the barrier beach segment from Southampton to Fire Island Inlet, where there is an extensive open water lagoon system in back of the barrier beaches, with few inlets; and the segment from Fire Island Inlet to Coney Island where inlets are more frequent, the barrier beaches shorter, and the back-barrier lagoon is being filled in by sediments and dominated by marshes. A similar pattern of barrier beach segments occurs along the Jersey Shore south of Sandy Hook, but only the first - the mainland-fronting beach area from the Atlantic Highlands south to the Manasquan Inlet - lies within the New York District.

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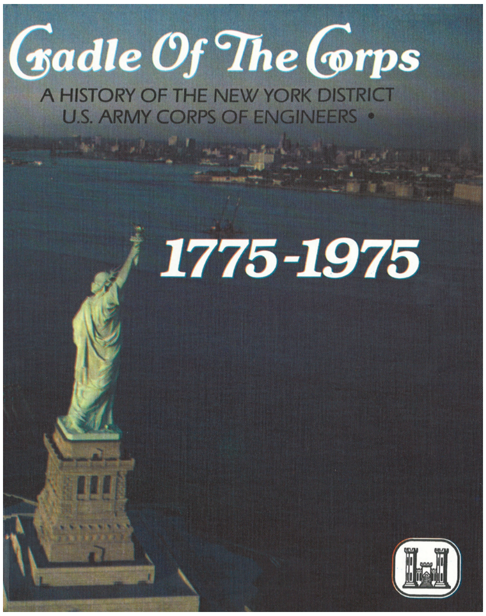
The First Two Centuries

by Christopher Ricciardi, Ph.D. and Carissa Scarpa



What follows is a brief summary of the first 200 years of the New York District's history from 1775 to 1975, based on the book ***Cradle of the Corps*** *by Marion J. Klawonn, published in 1977. This summary is intended to provide the reader with context for the continuing story presented in this volume.*

The U.S. Army Corps of Engineers has its roots in the years immediately preceding the Revolutionary War. In June of 1775 General George Washington appointed Colonel Richard Gridley as the Continental Army's first Chief Engineer. Gridley's need for experienced staff was largely filled by French-trained engineers such as Major General Louis Le Bègue Duportail and Colonel Louis La Radière. Originally headquartered in New York City, Gridley's engineers supported the Continental Army by designing and constructing new defenses, identifying probable battlefields, reconnoitering enemy positions, and making necessary improvements to existing defenses. New fortifications were constructed on Manhattan Island, Long Island and at several locations along the Hudson River as far upstream as Lake Champlain, more than 200 miles north of New York City.

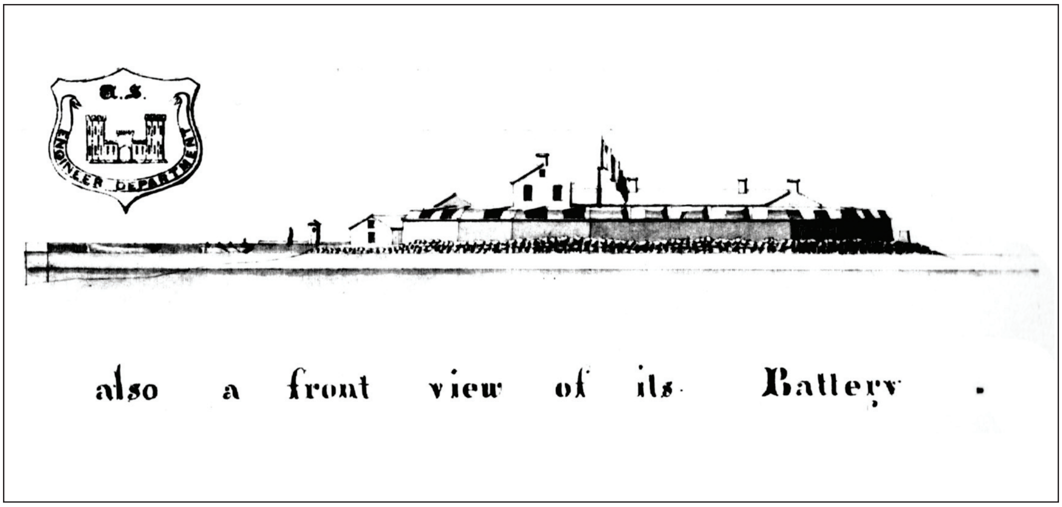
The British strategy during the early years of the War for Independence was to isolate New England from the other rebellious colonies by controlling the Hudson Valley. Although the British were victorious in the Battle of Long Island early in the war and thereafter used New York City as their principal base, they were never able to fully control the Hudson River corridor, in part because of the efforts of the Army's engineers. In the late summer of 1777, British General John Burgoyne led a force from Canada toward the Hudson intending to join forces with General William Howe in New York. The Army's engineers, led by Colonel Thaddeus Kosciuszko (a Polish national recruited in France by Benjamin Franklin), slowed Burgoyne by burning bridges, flooding lowlands and blocking roads in Vermont. Burgoyne's force was stopped altogether at Saratoga Springs, New York, in September and October of 1777 by a company of Continental soldiers manning defenses designed by Army engineers.

In 1779, Congress passed a resolution officially creating the Corps of Engineers. In the fall of 1781, at the decisive Battle of Yorktown where Washington's defeat of British troops commanded by General Charles Cornwallis led to the negotiations that ended the war, a special section of the Corps, known as the "Sappers and Miners," designed and built fortifications and performed valuable reconnaissance. In 1783, at the close of the Revolutionary War, the Corps of Engineers, along with the majority of the Army, was disbanded, its duties fully discharged.

In the following year, in response to turmoil in Europe, which it was feared might threaten the fledgling United States, Congress authorized the recruitment of a Corps of Artillerists and Engineers to be stationed at West Point. For a second time, the nation had need of a special engineering force and at West Point there was now a place where the Army could train its own engineers. In 1802, President Jefferson introduced legislation once again creating a Corps of Engineers and recognizing West Point as a military academy. The Chief of Engineers subsequently acted as Superintendent of the West Point Military Academy until 1866.

In the early years of the nineteenth century the Chief of Engineers also served as Acting Inspector of Fortifications for New York harbor. While the Napoleonic Wars were tearing Europe apart, the Corps was tasked with improving and supplementing the earlier system of coastal Revolutionary War fortifications in preparation for possible conflict. Repairs and improvements were made to existing forts along Lake Champlain and the Hudson River, and in New York harbor, and at least eight new forts or batteries were designed and built within the harbor. By the end of the first decade of the nineteenth century, with new defenses and a strengthened infrastructure, the nation was better prepared for the renewed conflict with Britain known as the War of 1812.

The service of the Corps of Engineers during the War of 1812 bolstered its reputation. In the lead-up to the war and throughout the period of formal armed conflict between 1812 and



Fort Gibson at Ellis Island in 1813, one of several early federal fortifications within the New York-New Jersey harbor [National Archives, Record Group 77, Drawing 36, Sheet 20]

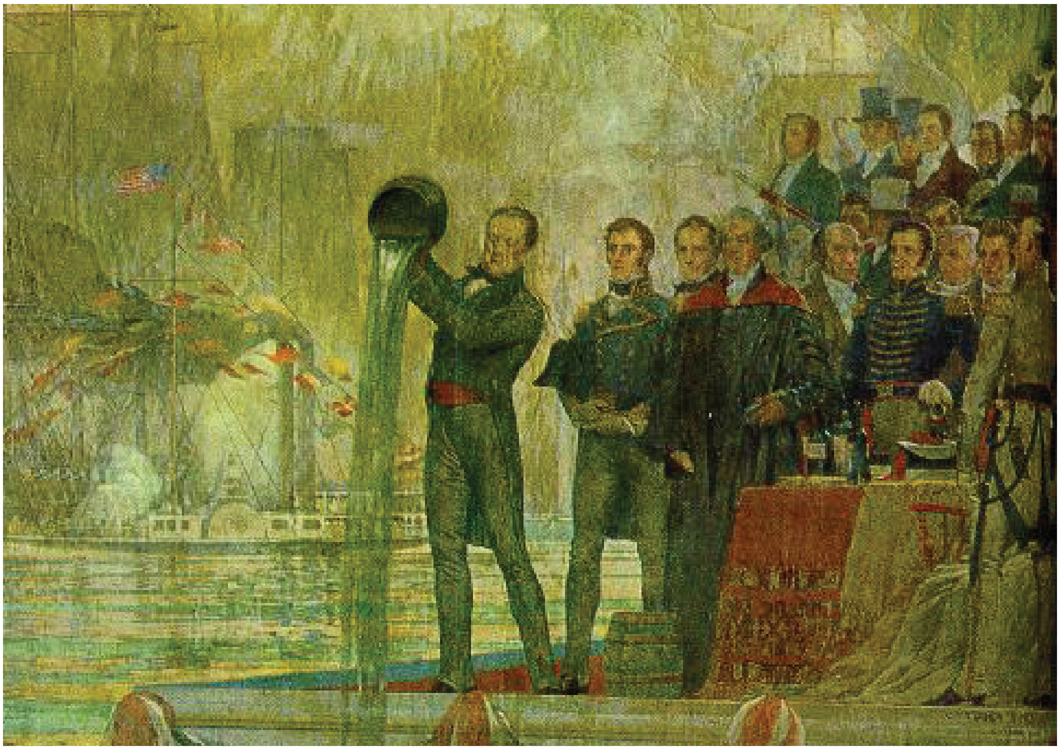
1815, the Corps supported the Army in much the same way that it had during the American Revolution, by constructing fortifications, performing reconnaissance and mapping tasks, and reconnoitering the movement of armies. The West Point Academy was heralded as a success for having schooled numerous engineers who were active in the War of 1812, including Joseph Totten and Jonathan Swift. After the war, in 1815, Congress moved to decrease its forces to an appropriate peacetime level; however, in contrast to the aftermath of the Revolutionary War, the Corps of Engineers was retained at full strength.

The success of the West Point Military Academy was further evidenced by Congressional authorizations in support of improvements to the school's curriculum, its organizational structure and its infrastructure. Over a period of forty years the academy was transformed from a small collection of buildings to a fully functioning military educational campus. All the necessities for a military training, including additional barracks, cavalry stables, an ordnance laboratory, an extensive library, even a chapel, were put in place.

In peacetime, although new coastal fortifications were periodically built and a number of other military construction projects continued, the Corps of Engineers also began to take on civil works projects. The first navigation act in the nation was enacted in 1824, authorizing dredging of the Ohio and Mississippi Rivers. This new civil works emphasis reflected the Corps' overall national mission at the time and several navigation projects were contemplated for the New York region. By the end of the first quarter of the nineteenth century the Army had established various Corps of Engineers districts around the nation. The New York District's first navigation project began in 1834 when Congress passed an act that authorized the removal of obstructions in the Hudson River with the intent to improve navigation.

This endeavor, known as the Hudson River Project, resulted in the Corps pioneering and developing several new engineering techniques. Along with the dredging work on the Hudson River itself, innovative diking and damming projects were undertaken on many of the river's smaller tributaries as part of the linkage between the Hudson River and the Erie Canal. The combined Hudson River and Erie Canal navigation system, in operation by the mid-1820s, dramatically improved opportunities for settlement and transportation of goods and materials across the Appalachians into the Upper Midwest.

By 1855, encroachments extending out from the East River and Hudson River shoreline of Manhattan were becoming a major impediment to navigation and to the economic health of New York harbor. To address these issues, a Harbor Commission was created by the New



*Governor DeWitt Clinton of New York pours a cask of water from Lake Erie into the New York-New Jersey harbor in celebration of the completion of the Erie Canal in 1825 [**Marriage of the Waters** mural by C.Y. Turner, DeWitt Clinton High School, New York City]*

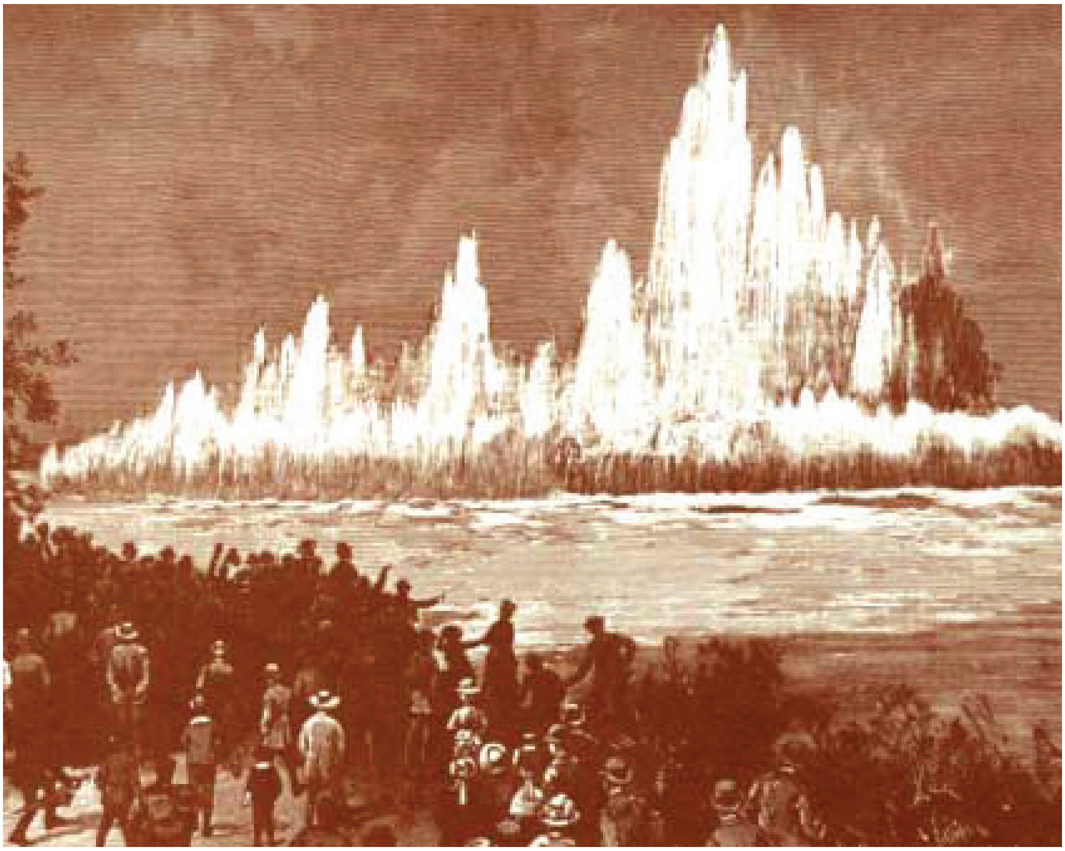
York State legislature and an Advisory Council was assembled which included the Chief Engineer of the Army Corps (Colonel [later Brigadier General] Joseph Totten), the Superintendent of the U.S. Coast Survey, and a Commander of the U.S. Navy. Over the years and with the help of General Totten and his associates on the Advisory Council, the Harbor Commission created a series of anti-dumping laws, harbor delineation laws, and eventually the Office of the Supervisor of the Harbor in order to prevent further waste buildup and to maintain New York City's vital shipping systems. The Council commissioned surveys and delineated an encroachment line for the harbor.

The surveys of New York harbor called attention to a number of previously uncharted rocks, reefs, and sandbars within the Lower Hudson that were impeding navigation. This was the beginning of the next major navigation project involving the most treacherous segment of the harbor – Hell Gate. Hell Gate refers to the confluence of the East River and the Harlem River where Long Island Sound connects with New York harbor. In addition to tumultuous tides and rapid currents through Hell Gate, the area was full of rocks, reefs, and islands that caused the current to turn unexpectedly in every direction and drive ships aground.

Before the Civil War broke out and money was diverted elsewhere, the Corps and its contractors worked at reducing the impediments in Hell Gate, but with limited success. In 1867, when interest in Hell Gate was revived, the Army Corps Chief of Engineers, Brigadier General Andrew Humphreys, assigned Lieutenant Colonel John Newton to the project. Hell Gate was to be lowered to a depth of twenty-six feet.

Early on contractors had difficulty completing this work within the agreed-upon schedule. In 1869, after contractors had twice failed in this effort, the Corps decided it would be better to do the work using its own staff and resources. In the end, it was determined that the desired pace of demolition would only be achieved by drilling into the rock and blasting it from within. Because no such drilling rig existed at the time, Lieutenant Colonel Newton invented one himself. The aptly named "General John Newton" was active for the next twenty years drilling and blasting in the harbor.

One of Newton's first major undertakings in Hell Gate was demolition of Hallets Point, a project that caught the attention of the nation for its pioneering approach and magnitude. Hallets Point was a particularly dangerous reef covering three acres that jutted out into the East River at Astoria, Queens. However, such turbulent waters were encountered here by the drilling rigs that an alternate strategy for removal of the reef had to be devised. A solution was found by tunneling below the reef from land and blasting it from deep within. After first constructing a 310-foot-long cofferdam, workers dug a 33-foot-deep vertical shaft and from this dug a series of tunnels fanning out in all directions. When the digging was completed about six years later, Hallets Point sat atop an immense cave with a series of stone piers supporting a roof about ten feet thick. The cavern was then filled with explosives that were spectacularly detonated. On the afternoon of September 24, 1876 a large crowd of spectators watched as the blast generated a 123-foot-high spray of water and rock debris. The shock was reported to have been felt throughout the New York and Brooklyn area. An underwater blast of this magnitude had never been attempted before. So successful was the work at Hallets Point that Flood Rock (now referred to as Middle Reef) was removed by the same method on October 10, 1885. Roughly six times the amount of explosives were used to complete this project. The observations taken from the blast provided valuable data that were used to guide the design of other similar projects in the future.



The blasting of Flood Rock in Hell Gate on October 10, 1885 [Library of Congress]

After the Civil War, the New York region experienced a boom in industry. Factories and finishing plants along the Hudson and Passaic rivers were in high demand. Waterways provided the principal means for moving goods in the New York metropolitan area during this period and this fact highlighted the value of navigation routes in and around the harbor. For this reason, the number of Corps of Engineers civil works projects in the New York area expanded from five to thirty-eight after the war. Most of these projects were aimed at improving navigation channels and harbors throughout the tri-state region. The Hudson River Project continued and was expanded to deepen the entire length of the main river channel to at least twelve feet and soon after the Corps began improvements along sixteen miles of the Passaic River.

In 1888, the Corps began to make improvements to the Harlem River as well. To straighten the Spuyten Duyvil portion of the river, a 400-foot-wide channel was cut through Dyckman's Meadow creating the Harlem River Ship Canal and construction was carried out well into the twentieth century. Also during this time, cargo ships coming in and out of the harbor through Hell Gate and the East River became so large and drew such deep drafts that this northern entryway could no longer accommodate them. For this reason and because of a greater interest in the shipping docks along the Hudson and in Newark Bay, access from the south over the Sandy Hook bar became the preferred means of access into the harbor.

The Corps began a program of deepening selected waterways starting with the dredging to a depth of twenty-eight feet of Gedney's Channel, a natural passage through the Sandy Hook bar. Soon after, deepening to thirty feet was started for Gedney's Channel and the Main Ship Channel for access to the inner harbor, and for the Bay Ridge, Red Hook, and Buttermilk channels in Gowanus Bay. All of this dredging gave rise to the development of new rigs that could handle the work and proved that the Corps could adapt to the various needs of the region.

The Harlem River in the early twentieth century following several episodes of navigation improvement [Library of Congress]

By the mid-1800s, heavy dumping was taking place within the harbor and adjacent rivers. Only rarely were garbage and dredged material taken beyond the 300-foot dumping minimum limit that was required by New York City. These dumped materials were inevitably carried out by the current into the very channels the Corps was trying to deepen and maintain. While many laws, including the River and Harbor Act of 1886, declared it unlawful to dump materials within the New York harbor, there was no penalty for the action. Finally, in June 1888, an act of Congress assigned the Supervisor of the Harbor authority to set the limits of dumping areas and to enforce the law. In August of the same year, the Harbor Delineation Act enlarged the Corps' regulatory responsibilities by requiring builders to acquire permits for construction that encroached upon the established harbor line.

As the Corps' civil works responsibility increased in terms of the volume and variety of projects, the job of overseeing all of them was left mostly to the district engineer, an immense challenge for one person. As a solution, the New York District was divided into two distinct areas. All projects in New Jersey, Lake Champlain and the Upper Hudson became the responsibility of one engineer, while all other projects were overseen by the Chief Engineer. The district remained structured in this way from 1880 to 1907. Another change brought on by this shift from majority military undertakings to civil works projects was the creation of the Northeast Division Engineer Office located in New York City. This forerunner of the North Atlantic Division was created to improve the management of the district's increasing number of projects and its fast-growing area of responsibility.

In the mid-1880s, Congress created the Endicott Board to plan improvements to coastal forts and a Board of Ordinance and Fortifications to supervise the work. Along with upgrading armament and making repairs to existing forts, the boards planned and oversaw the construction of several new smaller installations that were more efficient, less physically imposing and more cost effective to build. This building program continued until 1920.

To assist the growing needs of Congress and the nation, the Corps was authorized to develop a secondary engineering school in 1869. By the end of the nineteenth century, because West Point's curriculum had expanded and de-emphasized engineering, a new academy was created at Willets Point, New York, on the Throg's Neck waterfront in the Bronx. Designated as the home of the Engineer Battalion and an official storage depot for remnant engineering materials not used in the Civil War, Willets Point was a logical choice as the site for a new engineering school. The expanded curriculum included work on submarine mining techniques and instruction in torpedo mining. Over time, the Willets Point Engineers School of Application significantly advanced the field of engineering through experimentation. The school operated for almost thirty years in the Bronx, until it was moved to Washington, D.C. in 1902.

The "Castle" at the Willets Point Engineering School, completed in 1887, served as the officers' mess hall and club [Library of Congress]

The turn of the twentieth century was not only a time of great change for the country, but for the Corps of Engineers and New York District as well. Two World Wars, several military conflicts, the Great Depression, new laws and regulations, economic expansion and population growth unparalleled in the nation's history all caused the district to confront new challenges and missions.

In 1900 the continuing expansion of port-related activity in the New York harbor led Congress to authorize the district to expand the Ambrose Channel to a depth of forty feet, a length of 38,000 feet and a width of approximately 2,000 feet. The massive scale of this project again proved beyond the capability of contractors alone and the district commissioned the construction of four dredges to assist in its execution. Although the majority of the project was completed within seven years, it was not until 1914, fourteen years after authorization, that the expansion of the Ambrose Channel was fully completed.

At the turn of the twentieth century domestic and construction refuse continued to litter local waterways, causing hazardous conditions including negative effects on the potable water supply, the fishing industry, and navigation. The district continued to work with the New York City and New York State to expand and enact anti-dumping regulations for the harbor. During the first decade of the century, there were approximately thirty active projects including major undertakings at Hell Gate, on the Harlem River and in the Upper Hudson, in addition to the harbor project.

The dawn of the First World War saw the district working on two fronts: in support of the war effort and continuing its many civil works projects. During this time the district was asked by Congress to raise the battleship *Maine*, which had been sunk in 1898 off the coast of Havana, Cuba which directly led to the Spanish-American War. The district engineers said the ship was

*The sinking of the battleship **Maine** in 1898 helped push the United States toward war with Spain [Library of Congress]*

raised using an innovative cofferdam system. With this system in place, the remains of American servicemen could be removed and the hull was brought to the surface in preparation for a ceremonial re-sinking.

During World War I, the majority of New York District military personnel transferred overseas. Retired former commanders were asked to take over the district while active-duty personnel served the war effort. Funding for civil works projects was severely limited at this time. However, three major undertakings continued: the expansion of Governor's Island; the construction of military and civilian works at Plattsburgh, New York; and the start of the Troy Lock and Dam Project, which tied into the Erie Canal system. After the war, the Corps' cleanup of the New York waterways continued and a new mission was briefly given to the New York District. In commemoration of past military and historical events, the district was asked to help design and oversee construction of new monuments in and around the New York area.

*In 1912 the Corps of Engineers raised the **Maine** with the help of a coffer dam and ceremonially sank the vessel off the Cuban coast [U.S. Army Corps of Engineers Office of History]*

The Great Depression caused the district's area of operation to undergo major change. Congress, in an effort to have the New York area run more efficiently, and to save funds, consolidated the various district offices into a single unit. Outlying offices were no longer maintained in Staten Island, Long Island and elsewhere in New York State. Although the district added few new projects to their workload, many existing projects continued, were expanded, and were well funded through this period. Much of this work was completed through partnering with developing organizations such as the Civilian Conservation Corps (CCC), the Works Progress Administration (WPA) and the Public Works Administration (PWA). The district provided quality control and oversight for these civilian organizations.

Twenty-two active projects kept the district moving throughout the inter-war years. Major civil works began in Vermont, in the Wallkill Valley and in the Susquehanna River Basin. The Erie Canal – Lock and Dam program was expanded, requiring the district to become involved in the construction of new bridges, dredging, changing water routes and occasional roadwork along the waterways. In the 1930s, Congress continued to add to the mission of the New York District by authorizing studies for numerous flood control and shoreline (storm damage) protection projects. Work soon began in the Raritan Basin in New Jersey, and at several locations along the south shore of Long Island, including Coney Island, the Rockaways and Fire Island. These projects became major undertakings for the district for the remainder of the century.

By 1941, the district's workload had swelled to fifty-eight projects. However, this all changed with the bombing of Pearl Harbor and the entry of the United States into World War II. Once again, the majority of the district's military personnel were deployed overseas. Funding was cut for most civil works projects and no new projects of this type were started for the duration of the war. However, as part of its continuing mission to maintain the port of New York and the rapid growth of manufacturing and movement of goods attendant on the war economy, the main channel leading into the Port of New York and New Jersey was dredged to a depth of forty-five feet.

During this same period the New York District was challenged when certain local contractors and members of the general public began to question the methods and execution of some of the Corps' undertakings. Complaints ranged from failures to make payment to contractors to "over-studying" projects to dissatisfaction over the rate of project completion. The growing number of flood control and shore protection programs had also yet to make much of an impression on the general public and calls for more work under these programs were being questioned as well. Flood control projects in the Passaic drainage basin of New Jersey began in earnest soon after the end of World War II. These particular projects went through numerous phases and generated many studies over the next forty years. They were followed by several shoreline protection projects in the Newark Bay and along the New Jersey coast.

The 1950s and 1960s saw sustained economic growth throughout the nation and in the New York metropolitan area. New York District work focused on the Passaic and Newark Bay projects along with new efforts to clean up the waters in and around the New York harbor. The district acquired a new boat, the *Driftmaster*, the first since the selling-off of the turn-of-the-century dredges. Military projects, including an almost complete redesign of the Plattsburgh Air Force/Army Base, also expanded during this period.

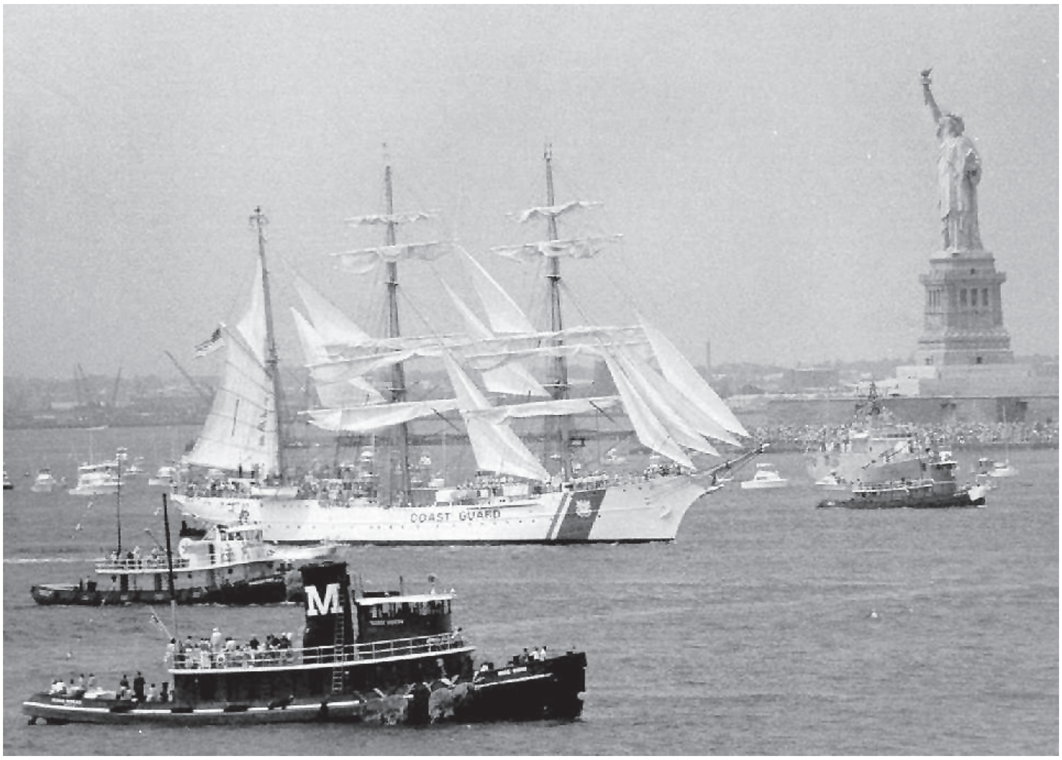
During the late 1960s the Corps of Engineers experienced another great challenge with the passage of two federal laws, the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA). In simple terms, these laws required that federal undertakings must consider their potential effects on the natural and cultural environment. These statutes also called for public input in their implementation and required the distribution of reports to relevant federal agencies and other interested parties for review. The new laws required that there be a systematic review by local and state agencies, private organizations, and individuals before any Corps of Engineers project could proceed. This legislation spurred the Corps of Engineers and the New York District to develop new and improved business practices and led ultimately to the adoption of a code of Environmental Operating Principles in the new millennium.

The New York District was busy in the early 1970s. The Military Branch received Congressional authorization for improvements at West Point, New York, a decade-long project. Work was also undertaken at several other military installations in the district, including the Watervleit and Picatinny arsenals, McGuire Air Force Base, and Fort Monmouth.

As a result of the new environmental regulations, the Regulatory Branch of the district expanded greatly, since the onus of ensuring that certain key aspects of the new laws were followed fell to the Corps. The terms under which permits were evaluated were significantly expanded. A short-lived mandate by Congress also charged the district to work with the U.S. Postal Service to construct new facilities, most notably a major new bulk-handling facility in Secaucus, New Jersey.

The number of flood protection projects increased in New Jersey when a succession of devastating floods hit the northern and central portions of the state. The Passaic River Basin Project went through a series of iterations as many residents, empowered in part by the new environmental regulations, objected to the district's proposals. In the realm of shoreline protection, new projects were activated in Long Island at Rockaway, Jones Inlet, Gilgo Beach and Fire Island. Also in this period, Staten Island saw the start of its first shoreline protection project in more than seven decades. With the approach of the Bicentennial and with massive celebrations planned for New York harbor, a major initiative was undertaken to finish the cleanup of the harbor area.

In the years 1975 through 2005, the subject of the bulk of this book, the nation, the Corps of Engineers, and the New York District underwent enormous change. With expanded authority and budgets, the district continued to study and build important military and civil works projects, helping to ensure the safety of the area's residents and the health of its economy.



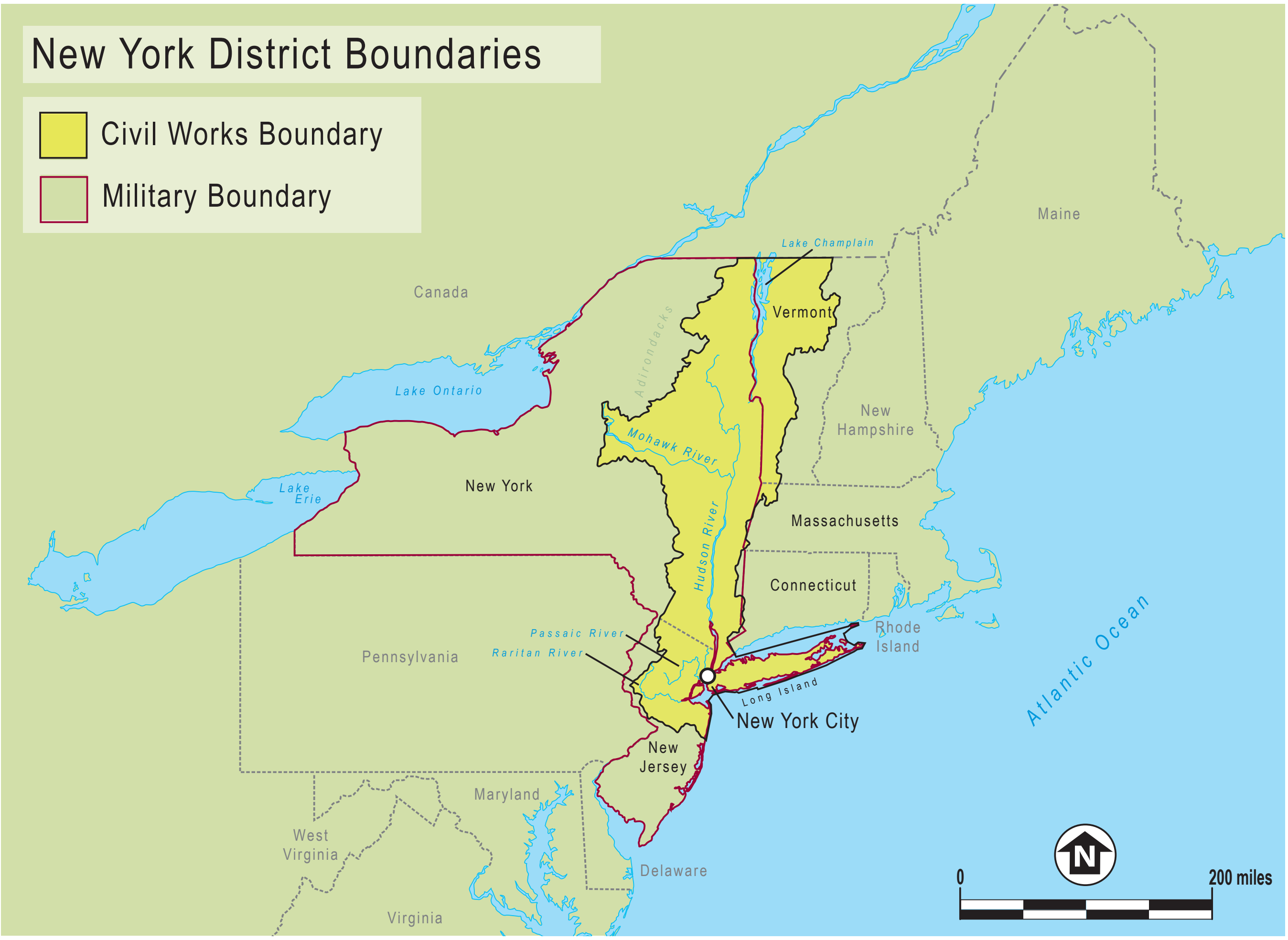
Vessels gathering in the New York-New Jersey harbor to celebrate the Bicentennial of the United States [U.S. Coast Guard]

1

The Evolving New York District

The United States Army Corps of Engineers is organized into eight divisions which are further divided into forty-one districts. A ninth division with three districts was activated in early 2004 to oversee operations in Iraq. The New York District is one of six districts within the North Atlantic Division. It is not physically large by Corps of Engineers standards, though its size can be measured in various ways because the district has three different sets of boundaries: one for civil works; one for military construction; and one for regulatory permitting.

Lower Manhattan skyline from Upper New York Bay



The district's civil works boundaries, which are defined by watersheds, contain 26,580 square miles that include portions of five states: western Vermont; small parts of western Massachusetts and Connecticut; eastern New York, together with Long Island; and most of northeastern New Jersey. Though comparatively compact, the district displays great natural variety. Its topography extends from the highest elevations of the Adirondack Uplands at one extreme to the sandy Atlantic shores of Long Island and New Jersey.

Watersheds are drainage or catchment basins that act like funnels catching and eventually channeling into a particular body of water any rain that falls within that basin. The New York District comprises three major watersheds. In the north it includes the United States segment of the basin drained by the Rivière Richelieu, a north-flowing tributary of the St. Lawrence River. The Richelieu Basin includes Lake Champlain and Lake George. Extending south from the Richelieu Basin is the upper Hudson River watershed, which extends south roughly to Bear Mountain.

The upper Hudson watershed also includes the Mohawk River, which extends west roughly to Oneida County. The lower Hudson-Long Island watershed is the largest in the district, extending to the Manasquan Inlet on New Jersey's Atlantic Coast, roughly seventy-five miles south of New York City. It includes all of Long Island as well as Long Island Sound east of the longitude of the New York-Connecticut boundary. The lower Hudson basin also includes Staten Island, the Hackensack, Passaic, and Raritan rivers in northern and central New Jersey, Sandy Hook and Raritan Bay.

In 2006, the district's military boundaries corresponded to the states of New York and New Jersey, although up until 1999 the district managed military construction in the six New England states as well. The district's regulatory boundaries, which are roughly similar in extent to its civil works limits, contain thirty-one counties in eastern New York State and northern New Jersey.

In administrative terms the district in the mid-1970s was similar in many ways to the district today. It had nearly 700 employees, the majority of whom worked in the Jacob K. Javits Federal Building and Customs Courthouse at Foley Square (the former site of the Five Points neighborhood) in lower Manhattan. The forty-one-story, International Style office building, which opened in 1967, is located roughly half a mile north of the World Trade Center site. The remainder of the district's employees worked at the Caven Point Marine Terminal, or at field offices around the region. District employees were involved in six main areas of work: military construction; regulation; flood damage protection; navigation; shore protection; and interagency and international support – within all of which they applied their technical expertise inventively and resourcefully.

New York District Headquarters, Jacob K. Javits Federal Building and Customs Courthouse, Manhattan

Caven Point Marine Terminal, Jersey City, New Jersey, where the New York District's floating plant is based

In the area of military construction, in the mid-1970s, the district provided engineering and construction services to Army and Air Force facilities in New York, New Jersey, six New England states (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island), and Greenland. A major expansion at West Point was also winding down. The student body at the academy had doubled in size from 2,200 to 4,400 students by around 1970. The facilities to support this expansion, which included barracks, academic buildings, a mess hall, a hospital, and a student activities building, were all complete by 1975, except the hospital, which won honorable mention in a Defense Department design competition in 1980, shortly after it opened.

In the mid-1970s the Department of Defense was emphasizing projects that enhanced the all-volunteer army, which had been established in 1973. As a result, the district had projects under way refurbishing recruiting stations and improving quality-of-life facilities at posts within its boundaries. A $20-million industrial modernization project was gearing up at Watervliet Arsenal; yet, while Watervliet was updating its manufacturing capacity, Picatinny Arsenal was reducing its production arm. Picatinny instead became a center of weaponry research and development, which was to lead to many district projects. In 1976 the United States Military Academy Preparatory School, known as West Point Prep, moved to Fort Monmouth, leading to some construction. Elsewhere around the district, Army Reserve posts were the source of a number of projects, most notably Fort Drum, a small facility near Watertown, New York that in the mid-1980s would produce the largest military project in the district's history.

Fort Drum, near Watertown, New York, site of a major military construction project begun by the district in the mid-1980s [Fort Drum]

The district was responsible for issuing permits for a variety of water-related projects. Beginning in 1972, as a result of the Clean Water Act, discussed below, anyone who wanted to build a pier, wharf, bulkhead, or similar structure in a navigable waterway needed a district-issued permit. The act of dredging and the disposing of dredged material, if it involved putting the material anywhere in the 700 miles of navigable waterways within the district, or in the ocean, required the approval of the Corps of Engineers. In the late 1970s, the number of permit applications averaged roughly 700 a year. Approvals were based on the effect of the proposed dredging activity on navigation, water quality, the environment, and to what degree the project was in the overall public interest. The evolving and increasingly multi-faceted regulatory program is discussed in Chapter 4.

An assortment of flood-related Corps of Engineers activities was under way by the mid-1970s. In Elizabeth, New Jersey, the district was building a flood protection project along slightly more than four miles of the Elizabeth River. Planning for the project, which included channel improvements, levees, a floodwall and flume, and the reconstruction or replacement of fifteen bridges, began in 1966. One of the bridges involved was the heavily traveled Pennsylvania Railroad bridge that is now part of the northeast corridor line of Amtrak and New Jersey Transit. Work on this bridge was finished in June 1977 and the entire project was completed in the late 1980s.

Besides the Elizabeth River, the district was working on flood control projects in the Saw Mill River basin, the Rondout Creek-Wallkill River basin in the Catskill Mountains of New York, and the Passaic River and Green Brook basins in northern New Jersey, among others. The Saw Mill River project was in Yonkers where a general design memorandum for flood prevention along the drainage was nearing completion. This was the first in a series of projects the district would undertake in the Saw Mill River basin. The Rondout-Wallkill project consisted of levees and a floodwall in North Ellenville, New York, a project that had been authorized by the Flood Control Act of 1962. These, and district activities in the Passaic River and Green Brook basins in New Jersey, are discussed in detail in Chapter 5. In the Passaic River basin the project was complicated by two underlying issues. One was the conflicting and changing views in Congress and in the New Jersey legislature about whether flood control should be treated in combination with water supply needs. The other issue concerned whether a basin-wide or smaller-scale incremental approach was preferable. In the Green

Flooding in Elizabeth, New Jersey, in the 1970s

Brook basin the water supply issue only came up briefly, but the debate over a basin-wide approach went on for many years, similar in many respects to the extended public discussion that surrounded Corps of Engineers projects in the Passaic River basin.

Flood emergency operations also occupied the New York District in the mid-1970s. In times of serious flooding the district was ready to help local authorities implement emergency measures, remove debris, and repair damaged flood protection devices. If requested by the Federal Disaster Assistance Administration, which was absorbed by the Federal Emergency Management Agency (FEMA) in 1979, the district also supplied municipalities with materials, equipment, and planning and administrative personnel to deal with any emergency.

The New York-New Jersey harbor was the focus of a large portion of the district's civil work in the mid-1970s. Three large projects were under way. In 1974 the district began a feasibility study on deepening the Kill van Kull navigation channel; plans and specifications were being drawn up for collecting potential sources of drifting debris in the East River; and the first iteration of the Dredged Materials Disposal Management Plan (later known as the Dredged Materials Management Plan) was on the drawing board. In addition, patrol boats surveyed the harbor round the clock, on the lookout for hazards to navigation and illegal dumping of harmful materials. The district's many projects in the New York-New Jersey harbor are treated in Chapter 6.

Flood debris and a distraught resident in Little Falls, New Jersey, in the 1990s

The district had one big shoreline protection initiative under way in the mid-1970s, the effort to develop a plan to protect the coastline of the south shore of Long Island. As part of the Fire Island to Montauk Point Beach Erosion and Hurricane Protection Project, the district had built fifteen groins in two increments in the vicinity of Westhampton Beach, and plans to extend the groin field further to the west resumed in 1975 after a brief hiatus. This endeavor, along with other shoreline protection activities, is detailed in Chapter 7.

Another smaller shore protection project was in progress at Rockaway Beach in the mid-1970s. A dual-purpose project for beach erosion control and hurricane protection had been authorized in 1965 and was built soon after, but in the spring of 1973 erosion at Rockaway Beach was again so bad that the stability of the boardwalk was in question. Approached by municipal and state officials, the district indicated that it could do the necessary engineering and design work quickly if Congress authorized it, and if a sponsor would execute the necessary local cooperation agreement. The Water Resources Development Act of 1974 separated construction of the beach erosion control portion of the project from the hurricane protection piece, which enabled the district to award a contract in August 1974. Roughly 3.7 million cubic yards of sand were on the beach by October 1975.

The district was also continuing its involvement with two projects that were to become part of the "Support for Others" initiative, a subset of the Interagency and International Services (IIS) program. One of these projects was the national Dam Safety Inspection Program, and the other, ongoing supervision of the Environmental Protection Agency's Wastewater Treatment Plant construction grant program.

For a few years in the early 1970s the Corps of Engineers was responsible for managing the construction of new U.S. Postal Service facilities. In the New York District this involved a pair of small projects in Manville and Kearny, New Jersey, and a very big one, the New York Bulk and Foreign Mail Handling Facility, in Secaucus. This latter project centered on a 1.4-million-square-foot facility that cost $130 million (equivalent to roughly $500 million in 2005 dollars), nearly half of which was expended on the mail and package handling machinery and related computer control systems. When the district took over the Secaucus project it was already well advanced, and under considerable scrutiny from Representative H.R. Gross of Iowa, the ranking member on the House Post Office and Civil Service Committee, who had alleged that the project was "shot through with blunders." The Postal Service, Congressman Gross objected, was building the project "in a swamp." And, in fact, one of the problems that the district solved when it took on the project was the need to put a ventilation system under the building's floor because of Postal Service complaints that unsafe amounts of methane were building up beneath it.

ENVIRONMENTAL LEGISLATION OF THE LATE 1960s AND EARLY 1970s

Between 1969 and 1980 Congress enacted dozens of bills aimed at lessening environmental degradation. Cumulatively these laws transformed the business of the Corps of Engineers. Whether they were working on military or civil projects, district employees in the mid-1970s were learning to operate according to the new rules of what is sometimes called the "environmental decade." Three laws had particular impact in the district.

The first of these was the National Environmental Policy Act (NEPA), signed into law by President Richard M. Nixon in 1969. NEPA did two things. It created the Council on Environmental Quality to advise the President and Congress on policy, and to serve almost as a final arbiter on questions of federal environmental policy. More important for the Corps of Engineers, the legislation mandated

MAJOR ENVIRONMENTAL LEGISLATION AFFECTING THE CORPS OF ENGINEERS

The **National Environmental Policy Act** (1969) requires that prior to any major action a federal agency must assess the action's environmental impacts.

The **Clean Air Act** (1970) requires industry and government to comply with clean air standards developed by the Environmental Protection Agency.

The **Federal Water Pollution Control Act Amendments** (1972) aim to ensure that all waters in the United States are fishable and swimmable through the elimination of all discharges of pollutants.

The **Marine Protection, Research and Sanctuaries Act** (1972) authorizes the Environmental Protection Agency to regulate ocean dumping of industrial waste, sewage sludge, and other waste through a permit program.

The **Coastal Zone Management Act** (1972) authorizes states to develop coastal management programs to protect estuaries and coastal waters.

The **Endangered Species Act** (1973) authorizes the Environmental Protection Agency to develop a list of endangered species and makes illegal the harming of all named flora and fauna.

The **Comprehensive Environmental Response, Compensation and Liability Act** (1980) provides a Superfund and authorizes the Environmental Protection Agency to identify, inventory, and clean up hazardous waste sites.

preparation of an environmental impact statement (EIS) for "major federal actions significantly affecting the quality of the human environment," and for all large projects of other entities in which there was a federal fiscal or regulatory interest. In other words, NEPA required government agencies to consider the environmental consequences of any major project before it was undertaken, and it provided an opportunity for the public to comment on the conclusions the agency reached. It pushed consideration of the environmental consequences of a project toward the front end of the planning process. NEPA was not designed to abate pollution *per se*; it did not deter polluters, nor penalize them. It did not even stipulate that a project could not proceed when an EIS found a high level of negative impact on the environment. Instead of acting as a decision document, it increased the degree of public scrutiny, establishing a kind of "look before you leap" approach to undertakings with environmental consequences. It required, in the interest of the local citizenry, a complete analysis of the long-term costs and benefits of any federal decision that might degrade public assets.

The main effect of NEPA on the work of the Corps of Engineers was in the preparation and evaluation of environmental impact statements and their lesser companion documents, environmental assessments (EAs). Districts needed to learn both how to write EISs and EAs for their own undertakings, and how to evaluate those written by others for their permit applications. The legislation specified five components of an EIS: the environmental impact of the proposed action; any adverse environmental effects which cannot be avoided should the proposal be implemented; alternatives to the proposed action; the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. NEPA provided no basis for determining what a "significant" impact was. But by establishing the principle that there were unquantifiable natural values that needed consideration, it cast a long shadow. Nationally, in 1973, for instance, the Corps of Engineers dropped twenty-three projects, suspended forty-four, and significantly modified 197 others as a result of EIS findings.

Unlike NEPA, which was largely about process, the second key piece of environmental legislation, the Federal Water Pollution Control Act Amendments of 1972, established fixed standards. Passed by Congress over President Nixon's veto, and later known as the Clean Water Act, these amendments set a broad goal of restoring the nation's waters. They called on the newly established Environmental Protection Agency (EPA) to adopt guidelines for ocean dumping sites that minimized the negative effect of dumping on water quality, biota, or recreation, and they empowered this agency to prohibit the use of a disposal site where discharges would have sufficiently adverse effects. Section 404 of the Clean Water Act authorized the Corps of Engineers to issue permits for discharging dredged material or placing fill. Simply put, after passage of these amendments, anyone wanting to dispose of dredged material or place fill in navigable waters needed a permit from the Corps of Engineers. The Corps was required to decide about granting a permit based on EPA standards for what was acceptable to be deposited in the water.

The third law, the Marine Protection, Research, and Sanctuaries Act of 1972, often called the Ocean Dumping Act, was in many respects a corollary to the Clean Water Act. It prevented, or strictly limited, "the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities." The EPA was authorized to designate appropriate ocean dumping sites and to develop a permit program for regulating the sewage sludge and industrial and other waste that went into them. The Corps of Engineers was authorized to issue permits for the transportation of dredged material for ocean disposal based on particular criteria, including physical and biological testing standards, outlined in the legislation. Successful applicants for Corps of Engineers permits had to demonstrate that their projects required dredging and that there were no suitable alternatives to ocean dumping for disposal of the dredged material. These bills affected the Corps of Engineers and the

A bottom-opening barge containing drift debris being towed out to sea for ocean disposal

THE CLEAN WATER ACT AND THE U.S. ARMY CORPS OF ENGINEERS

Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (the Clean Water Act) authorizes the U.S. Army Corps of Engineers to issue permits for the discharge of dredged or fill material into navigable waters, including jurisdictional wetlands, at disposal sites designated by the Environmental Protection Agency (EPA). Permits are not required for activities such as ordinary farming, silviculture, and ranching. EPA is mandated to prohibit the use of a disposal site when it determines that discharges have an unacceptably adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreation.

EPA is directed to adopt guidelines for disposal sites, which the Corps of Engineers must apply in its permit decisions. The Corps may issue permits on an individual basis or general permits on a state, regional, or national basis. A general permit may be issued for activities that are similar in nature and that will only cause minimal adverse environmental effect, separately and cumulatively. The Corps is required to notify the U.S. Fish and Wildlife Service when an application for an individual permit is received and when it proposes to issue a general permit. The Fish and Wildlife Service must comment within 90 days.

Procedures are established for state assumption of the permit program in which the Fish and Wildlife Service and the Corps of Engineers provide advice to EPA regarding transfer of the program to a state.

New York District in two specific ways and one general one. Foremost, they complicated the district's own work, particularly the disposing of material dredged from the navigation channels for which it was responsible. This topic is detailed further in Chapter 6. They also changed the regulatory operations of the district by expanding the Corps' role in ocean dumping permits and by creating a whole new regulatory domain centered on wetland environments. This subject is treated in Chapter 4. Generally, and no less important in the long run, another entity, the EPA, acquired some authority over the manner in which the district conducted several of its main pieces of business.

An early outcome of this changing legal climate was the need to hire staff with expertise in areas far removed from the Corps' traditional engineering disciplines. For example, while the district had been adding biologists to its staff since the 1960s, one of the new professions to be represented within the district in the mid-1970s was public archaeology. The expertise of professional archaeologists grew in importance to the district as it wrestled with the impact statements and assessments required under the terms of NEPA and the National Historic Preservation Act of 1966. It is worth noting that although attention usually focuses on the legislative developments of the early 1970s, change was under way earlier than this, and the district had been working to be responsive to the growing environmental consciousness of the American public for some time.

The largest internal change in the district in the 1960s and 1970s was related to these external influences. Critics complained that the main result of NEPA and related environmental legislation of this period was an unreasonably long planning process; some even suggested that a comprehensive planning process became an end in itself. The district, which saw planning as the means for finding the best way to meet its Congressional mandate and address problems the public wanted solved, created a planning board in the engineering division in the early 1980s. This board soon grew into a full-fledged planning division.

The main purpose of the district's planning division was to help decision-makers identify water resources problems, conceive solutions to them, and weigh the social, economic, cultural, environmental and political impacts of the various possible solutions. In 1984 the district had more than $5 million earmarked for planning, among the highest planning budgets within the entire Corps of Engineers system. The biggest efforts that these funds supported were the Passaic River Basin flood control project, which is treated in Chapter 5, and two of the New York harbor deepening projects. The largest single endeavor was the New York Harbor and Adjacent Channels Navigation Study, which accounted for almost one third of the planning funds that were secured. The main channels in the harbor – those that led from the lower bay into the upper bay and as far upstream as mid-Manhattan – were then forty-five feet deep and this study investigated deepening them to sixty or even seventy feet to accommodate deep-draft coal ships that were expected at a new coal port then under consideration. A similar, smaller feasibility study for deepening the Kill van Kull and Newark Bay channels was also funded. Although the coal port plan was abandoned, harbor deepening projects remain important in the district and are discussed at length in Chapter 6.

A New York District cultural resource specialist inspecting remains of a historic flood control structure in New Jersey's Hackensack Meadowlands

THE NEW YORK DISTRICT DURING THE 1970s

While the district was busy in the late 1970s it was not a period of major growth for the Corps of Engineers. There are economic and political reasons for this. Generally prosperous decades in the 1950s and 1960s were followed by an economy that stagnated and then dipped into recession. Political disillusion that followed President Nixon's August 1974 resignation in the wake of the Watergate scandal was compounded by the April 1975 fall of Saigon and the withdrawal of American troops from Vietnam. In 1976 allegations that the South Korean government was buying influence touched 115 members of Congress. This all translated into an unfavorable climate for new government initiatives in general and the more so for the Corps of Engineers.

When President Jimmy Carter was elected in November 1976, he expressed skepticism toward a number of large water resource construction projects. For example, the Water Resources Development Act of 1974 (WRDA74) authorized only a few projects in New York. It included the beach erosion component of the combined beach erosion and hurricane flood protection project in Rockaway, which it approved because to delay such work would probably have resulted in higher costs later. It also authorized up to $14 million for a drift and debris removal project in the New York-New Jersey harbor. This project had been authorized in 1970 subject to arrangements for local cost sharing. WRDA74 removed the requirement that the district find a non-federal co-sponsor because the debris problem in the harbor was "extremely serious in both its navigation and in its public health and community aspects." The Water Resources Development Act of 1976, which was to be the last omnibus water resources bill for a decade, was comparatively small. It contained less than $700 million in new authorizations nationwide, including $12 million for a re-evaluation of flood control options in the Passaic River Basin and an authorization for construction at Liberty State Park.

Lower Manhattan with the twin towers viewed from Liberty State Park, Jersey City, New Jersey, in the late 1990s

District personnel approached these and other projects with a combination of technical expertise and imaginativeness that is a characteristic of the Corps of Engineers. An opportunity to display this spirit of resourcefulness came during the New York City transit strike of 1980. With its Transportation Management Branch in the lead, the district got 80 percent of its employees back and forth to work each day. Boats, buses, and vans were all employed. Many district employees served as volunteer drivers.

In the early to mid-1980s a new area of work opened up in the effort to clean up the lax environmental practices of the past. Work of this nature came to the district under two programs. Design and construction projects in support of the EPA's Superfund cleanup program began to be assigned to the district in 1982. In the following year the Defense Environmental Restoration Program charged the Corps with cleaning up Formerly Used Defense Sites (FUDS), leading to a considerable amount of work at Raritan Arsenal in central New Jersey. These programs are discussed in Chapter 8.

Another indicator of the gradually rising environmental awareness on the part of the district can be seen a few years later when the district made its first beneficial use of dredged sand. During a navigation improvement project at Moriches Inlet on the south barrier-island shore of eastern Long Island, the district was removing very high-quality sand from the Inlet. Rather than placing it in the ocean, the district put it on an adjacent beach. This bolstered the beach and also put sand into the littoral system, allowing it to further nourish down-drift beaches.

The district received a very large boost to its workload in late 1984 when the Department of Defense selected a remote Army Reserve training facility in upstate New York to be the home of a new infantry division by the Army. The Fort Drum project, which by the time it was completed in the early 1990s cost roughly $1.3 billion, had a large impact on the district, creating many new jobs both in New York City and at Fort Drum. These positions were a challenge to fill in part because the Corps of Engineers pay scales in New York, as in all other federal agencies, had not kept pace with the rates of growth in either the private sector or equivalent public sector agencies.

At the same time the district was ramping up for Fort Drum, a long standing logjam in federal water resources appropriations was broken. The most recent major water resources development legislation was the River and Harbors Act of 1970 and no omnibus water resources development bill had been passed since the Water Resources Development Act of 1976. In the early 1970s it had been customary for Congress to enact a water resources spending bill every second year. Most of the delay in the 1980s concerned the question of local cost sharing, an approach to project funding which the Reagan administration was very serious about implementing. As agreement on cost sharing for harbor deepening, shore protection, and other projects came close to reality, a supplemental appropriation that brought the district new work was passed in 1985. The district received funding for projects in Ardsley, Kill van Kull, Liberty State Park, and Moriches Inlet. Things got even busier the next year. As much change as the sweep of legislation from the environmental decade brought, the impact of the Water Resources Development Act of 1986 was even greater.

Moriches Inlet on the south shore of Long Island, New York, which the New York District keeps open for navigation

WATER RESOURCES DEVELOPMENT ACT OF 1986

The Water Resources Development Act of 1986 (WRDA86) is generally hailed for ushering in massive spending on water resources projects and for instituting a new system of cost sharing that significantly increased the amount of money state and local governments and independent authorities had to contribute to specific projects. This approach primarily reflected the desire of the administration of President Ronald Reagan to reduce both the size of the federal government and the degree of local reliance on federal funds for infrastructure construction.

WRDA86 authorized roughly $12 billion in federal spending; the approximate share of non-federal spending amounted to $4 billion. The law authorized 377 new Corps of Engineers water projects for construction or study, comprising: forty-three port projects; seven inland waterway projects; 115 flood control projects; twenty-four shoreline protection projects; sixty-one water resources conservation and development undertakings; thirty-eight studies; sixty-three project modifications; and twenty-six miscellaneous projects or programs.

The district received authorization for more than thirty projects under WRDA86, eight of which, totaling $400 million in authorized federal expenditures, involved the New York-New Jersey harbor. This represented over half the value of the entire district's authorizations in the bill, and more than 3 percent of the total funds authorized

THE WATER RESOURCES DEVELOPMENT ACT OF 1986 (WRDA86)

WRDA86 accomplished three major things: it increased the share of water resource project costs that non-federal interests such as states, port authorities, and commercial navigation companies had to bear; it made it a matter of law that environmental considerations were intrinsic to water resources planning; and it mandated that uneconomic projects would not receive federal support. The bill's impact in the New York District was enormous. It authorized funding for the following projects:

New York Harbor and Adjacent Channels, New York and New Jersey - estimated first federal cost of $156,000,000; estimated first non-federal cost of $170,000,000.

Gowanus Creek Channel, New York - estimated first federal cost of $1,540,000; estimated first non-federal cost of $1,770,000.

Kill van Kull and Newark Bay Channels, New York and New Jersey - estimated first federal cost of $167,000,000; estimated first non-federal cost of $158,000,000.

Fresh Kills in Carteret, New Jersey - estimated first federal cost of $19,500,000; estimated first non-federal cost of $6,500,000.

Arthur Kill, New York and New Jersey - estimated first federal cost of $27,500,000; estimated first non-federal cost of $15,100,000.

New York Harbor and Adjacent Channels, New York and New Jersey - estimated first federal cost of $32,300,000; estimated first non-federal cost of $13,400,000.

Rahway River and Van Winkle's Brook, New Jersey - estimated first federal cost of $12,500,000; estimated first non-federal cost of $5,000,000.

Robinson's Branch, Rahway River, New Jersey - estimated first federal cost of $20,000,000; estimated first non-federal cost of $6,600,000.

Green Brook Sub-basin, Raritan River Basin, New Jersey - estimated first federal cost of $151,000,000; estimated first non-federal cost of $52,000,000.

Molly Ann's Brook, New Jersey - estimated first federal cost of $16,200,000; estimated first non-federal cost of $5,400,000.

Lower Saddle River, New Jersey - estimated first federal cost of $25,800,000; estimated first non-federal cost of $10,700,000.

Ramapo River at Oakland, New Jersey - estimated first federal cost of $4,840,000; estimated first non-federal cost of $1,610,000.

Ramapo and Mahwah Rivers, New Jersey and New York - estimated first federal cost of $4,630,000; estimated first non-federal cost of $1,630,000.

Mamaroneck, Sheldrake, and Byram Rivers, New York and Connecticut - estimated first federal cost of $51,400,000; estimated first non-federal cost of $17,100,000.

Manalapan Township, New Jersey - total cost of $400,000.

Passaic River Basin, New Jersey - total cost of $3,750,000.

THE WATER RESOURCES DEVELOPMENT ACT OF 1986 (WRDA86) (CONTINUED)

Rockaway Inlet to Norton Point, New York shoreline protection - estimated first federal cost of $11,900,000; estimated first non-federal cost of $10,600,000.

Orchard Beach, New York beach erosion control - estimated first federal cost of $1,000,000; estimated first non-federal cost of $1,480,000.

Passaic River Basin snagging and clearing - estimated first federal cost of $25,000,000; estimated first non-federal cost of $8,300,000.

Passaic River, Beatties Dam - estimated first federal cost of $15,000,000; estimated first non-federal cost of $5,000,000.

Hudson River, New York; New York City to Waterford - estimated first federal cost of $113,000; estimated first non-federal cost of $37,000.

Sandy Hook to Barnegat Inlet, New Jersey - estimated first federal cost of $21,200,000; estimated first non-federal cost of $18,800,000.

East Chester Creek, New York - estimated first federal cost of $450,000; estimated first non-federal cost of $50,000.

In addition to these projects with estimated first federal costs of roughly $770 million, the bill authorized a number of projects without specifying funding amounts:

The Waterbury dam project in the Winooski River basin, Vermont.

20-year periodic nourishment of Westhampton Beach, New York.

Streambank erosion control program along the east bank of the Passaic River.

The New York Harbor and Adjacent Channel Study.

Study and monitoring of dioxin contamination in Passaic River-Newark Bay.

The navigation project at Mamaroneck Harbor, New York.

Operation, maintenance, and rehabilitation of the New York State Barge Canal; federal contribution limited to $5,000,000 a year. (Only a portion of the canal falls within the New York District's boundaries.)

Removal of derelict vessels from the western shore of Hempstead Harbor, New York.

In combination, the New York District projects accounted for roughly 10 percent of the total funding authorized in the WRDA86 legislation. The bill's impact on the New York District was not only financial: it also mandated the closing within three years of the Mud Dump as the customary site for disposal of material dredged in the course of maintaining and enlarging the federal navigation channels within the district's boundaries.

nationwide in this massive legislation. There were a number of other items of significance to the district in WRDA86, among them authorizations for the Green Brook Sub-basin flood control project, a handful of Passaic River Basin interim projects, and the Sandy Hook to Barnegat Inlet beach erosion control project.

It was not only, or even mostly, in quantity that WRDA86 was notable. More meaningful than the many water resources development projects that WRDA86 funded was the sea change it represented in water resource planning. The most far reaching change the bill introduced, and the one that gets the most attention, was cost sharing. In the area of flood control this legislation reversed a half-century policy in which the federal government had assumed full responsibility for financing flood control construction. Generally, from this point forward, the non-federal contribution was 35 percent. The law also required that non-federal interests pay half the cost of feasibility and other planning studies, which up to this point had also been wholly federally funded. But possibly its greatest impact was in the nation's harbors. WRDA86 required ports to pay a portion of the cost of navigation channel construction (the amount depending on depth). It also allowed port authorities to levy harbor fees to recoup some of their costs from the commercial interests that used the facilities.

Beyond the idea that non-federal interests should share more of the financial burden of water resource development, there was another notable aspect to WRDA86. The legislation also reflected the general consensus that environmental considerations are intrinsic to water resources planning. In this manner, WRDA86 therefore represented an important step in the development of the Corps of Engineers' environmental mission.

WRDA86 had unforeseen consequences as well. In the early 1970s water resource projects were planned around four objectives: regional economic impact; environmental quality; social well-being; and national economic development. Gradually these four original goals were re-cast as two major and two minor objectives. National economic development and environmental quality came to outweigh regional economics and social well-being as the driving force behind water resources projects. A preferred project became one that, consistent with protecting the environment, made the greatest net economic contribution to the national economy; and this was measured by cost-benefit analysis. When project alternatives were assessed the Corps was required to select the plan whose ratio of benefits to be derived from the project was highest relative to the public cost of the undertaking. Despite the complaint that this assigned economics too high a priority over other considerations, it was still essentially conducting planning from a national perspective. The water resources bill of 1986 made water resource planning as dependent on local ability to pay as on any fundamental net national benefit, economic or otherwise.

GROWTH AND ORGANIZATIONAL CHANGE

The twin stimuli of WRDA86 and the Fort Drum expansion led to a rapid growth in the number of authorized positions in the New York District. By 1987 the number of staff positions had reached 720 and in 1989 this rose to 785. But the vacancy rate was climbing too. In 1987 only 7 percent of the district's job lines were unfilled. In 1989 the ratio was three times as high with as many as 175 positions vacant. In the face of this the district leadership waged a campaign to have the salary rates adjusted. They demonstrated that the salaries the district was offering were not competitive with salaries offered by the private sector, by the quasi-private sector like the Port Authority, or even by public sector entities at the state and municipal level. Based on prices in the area they demonstrated that the typical district employee had no discretionary income after basic living costs were met. Eventually, along with the districts in San Francisco and Los Angeles, they won a "locality pay" adjustment that brought New York District salaries for all kinds of jobs, professional, technical, and administrative, into line with what similar jobs earned from other employers.

The Corps of Engineers prides itself on designing "state-of-the-art" facilities and using advanced scientific techniques in its studies. However, there was one area in which the New York District was behind the times: adapting computers to its own work environment. An information management planning study conducted in 1984 found the district equipped with one overloaded mainframe computer, eight personal computers from three different manufacturers, and a handful of computer-assisted design (CAD) terminals. The study also detected a widespread reluctance to use computers, which it attributed to a lack of computer literacy and the inadequacy of training programs. While some use had been made of personal computers in the early days of the Fort Drum expansion project, the digital revolution in the form of dedicated word processors and desktop computers did not take root in the district until the late 1980s and it proved beneficial to productivity. When the 3,000-page Passaic River Main Stem feasibility study and general design memorandum were completed in 1988 the clerical staff commented on how much more efficient they became after dedicated word-processors were introduced to the offices of the Passaic River Branch.

The period of great growth in the mid- to late 1980s was followed by concerns about contraction. When the Fort Drum program was completed in the fall of 1990, it was difficult for the district to find work for all of the personnel formerly assigned to the project. That was in part because a post-Cold War restructuring of the military was under way, and a moratorium on new military construction was in force. In November 1990 a publication of the New York District, the *District Times*, announced that the district was forced to reduce its workforce from nearly 800 to 650. The plan was for as many as possible to leave the workforce through turnover, attrition, and retirement. District leadership made strenuous efforts to help people find other jobs in and out of the Corps. In the end fewer than a dozen positions were actually eliminated, but the district workforce dropped to 650 in late 1991, and it has stayed within roughly 5 percent of that number since the mid-1990s.

Looking ahead, the district announced a strategy, consistent with Corps of Engineers rules and regulations, for educating the public about water resource issues and Corps capabilities. The *District Times* reported that district personnel were keeping Congressional representatives from electoral districts within its boundaries informed about the types of civil works projects the Corps of Engineers could perform. The district also hoped to be working with coalitions of business leaders interested in infrastructure improvements, such as the New Jersey Alliance for Action, to explain how the civil works appropriations process worked. The district thought it saw a possible new area of work in meeting some of the Federal Emergency Management Agency's post-natural disaster needs, providing damage estimates, flood insurance studies, and flood mapping programs. It also anticipated more work with EPA on cleanup projects and possibly with New York City on some of its long-term bridge maintenance and water supply needs.

Aside from working on emergency operations nationally, the district was also involved in the international military support program. In early 1991 the United States led a coalition of thirty-four nations that drove Iraq out of Kuwait during the Persian Gulf War. District employees were among the hundreds of volunteers who staffed the

Corps of Engineers' Kuwait Emergency Recovery Office, which helped with post-war cleanup and with repairing buildings, schools, roads, runways, electricity, water and sewer systems, and other infrastructure.

The biggest organizational change of the last thirty years, mandated by Congress, was formalized in the fall of 1992 when district engineer Colonel Thomas York announced the creation of a Program and Projects Management Branch, later Division, after four years of experimentation. The experiment actually began in 1988 with the creation of the position of deputy district engineer for project management. This set in motion a number of changes in the way the district did business. Most important, it led to the creation of project managers who stayed with their projects from start to finish, ending the practice of separate divisions – planning, engineering, construction – functioning as independent "stove pipes," passing planning and design documents off from one to another.

The New York District was the first of the Corps of Engineers' districts to implement the mandated organizational changes. The branch was initially staffed by twenty project managers, most of whom were transferred from the engineering and planning divisions. Under the new arrangement, the project manager headed a project delivery team whose members were empowered to act on behalf of their functional organizations (engineering, environmental analysis, construction, and so forth) in accord with a project management plan that assigned individuals to specific project-related tasks. The old approach in which one division took care of its own phase of the work before handing the project over to the next had led to problems of continuity and sometimes accountability, which the project manager concept was designed to alleviate. The new approach was effective; it met some important challenges and improved execution of projects.

The early to mid-1990s were eventful years in the district. On the south shore of Long Island, Westhampton Beach, where the district had been involved for twenty-five years, was breached by a storm in December 1992. Shortly after, New York State agreed to be the non-federal sponsor of an interim project along the reach that contained Westhampton, between Moriches and Shinnecock inlets. At the same time the first phase of a major beach restoration project in Monmouth County, New Jersey, got under way, while in 1994 the Coney Island shore protection project received funds. These projects are treated further in Chapter 7. While these big projects on the coast were moving along, the district was also completing an innovative repair on the Troy Lock and Dam, which is located at the head of tidewater navigation in the Hudson, a few miles north of Albany. The lock, which was built by the Corps of Engineers in 1916, is maintained and operated by the district. The repair, completed in spring 1992, by a woman-owned, small-business contractor, involved the use of pre-cast concrete panels to repair scour holes in the lock walls caused by the freeze-thaw cycle.

The district was also involved in a complicated issue in the New York-New Jersey harbor. Rising concerns about the level of contamination in the sediment collected during maintenance dredging of the navigation channels led to a dispute over how to dispose of the material, which potentially threatened the vitality of the harbor. This required the district to balance the competing demands of all interested parties, frequently referred to as stakeholders, in the harbor and reconcile its growing environmental responsibilities with its older mission to keep the port at work. This topic is expanded on in Chapter 6.

In the spring of 1996 the Clinton administration announced a new policy on shore protection projects in line with its effort to reduce the federal budget deficit. Thenceforth the federal government would make no new long-term commitments to major beach replenishment projects when the economic benefit went mostly to recreation. The administration argued that these projects were not truly in the federal interest. At considerable federal expense they provided substantial income to state and local economies; yet the states and localities had in many cases been called on to contribute a share of project costs that equaled only a small fraction of the income the restored beaches would generate. The administration did acknowledge that prior commitments would be met, which allowed major district projects such as Fire Island to Montauk Point and Sea Bright to Barnegat Inlet to go forward, and it also opened the door to negotiations with Congress about exceptions to this general policy. This left some of the unauthorized

Troy Lock and Dam on the Hudson River above Albany, New York, subject of Corps repair work in the early 1990s projects with a lease on life, but as Chapter 7 explains, a few were delayed as a result of this policy.

While all this was going on, the prospect of fundamental change at the New York District loomed. The Energy and Water Development Appropriations Act of 1997 directed the Corps of Engineers to reduce the number of its divisions from eight to six and also close several districts. There were some discussions at the time of this rearrangement that would have profoundly affected the district, including relocating its overseeing division to New England, but this never came to pass. This divisional reorganization laid the basis for a more efficient allocation of resources in the future, and the Business Improvement Team idea was an outgrowth of this reorganization. This concept involves the sharing of resources and expertise across districts, while maintaining a "strong customer focus." Using this approach the North Atlantic Division serves as a central program marketing operation, distributing work to its districts based on their special capabilities.

An essential piece of the Business Improvement Team idea was the Corps of Engineers Financial Management System (CEFMS), which was introduced in 1998. Contract management is a very large part of what the district does, and while there were some start-up problems, CEFMS is considered one of the best cost accounting systems in government, enabling managers to have timely data when they have to authorize expenditures to contractors or collect reimbursements from other federal agencies.

Structural reorganization and improved accounting systems were not the only administrative changes to occur in or around the district during the 1990s. Despite managerial improvements in the Programs and Projects Management Division, some problems remained. Nationwide there had been difficulties defining the roles and responsibilities of project managers and project delivery teams. In 2000 the Corps of Engineers implemented a new project management approach called the Project Management Business Process (PMBP), which changed the culture of the organization. Based on a corporate business model, its aim was to make the districts into project-management-oriented organizations more clearly focused on the final outcome of a project. Under PMBP a project delivery team prepares a project management plan at a project's onset. The plan, which operates during a project's entire life, details the budget and schedule; it delineates all the team members and their roles; and tries to consider all other details that will arise as the project proceeds over time. Because this business model keeps the necessary technical people involved in every phase of the project, it improves their working relationship with the project managers. PMBP encourages staff members to ask not only "what is my job?," but also "what needs to be done?," which actually was a question New York District employees were already accustomed to asking. The corporate board, which consists of the senior district leadership, steers the projects. At its regular meetings it hears of difficulties projects are facing and can direct project management teams to move in new directions.

An area of work that has grown in recent years is the Interagency and International Services (IIS) program. The IIS program covers work of local, regional, or national significance that is performed by the Corps of Engineers but funded by other public agencies. Eligible organizations include federal agencies (other than the Department of Defense) and state and local governments that receive federal funds. The Corps' IIS clients benefit from the program through the application to their missions of the engineering and other expertise of the Corps of Engineers. The Corps benefits from the IIS program in two ways. It enhances the Corps's ability to perform its own functions by giving it an expanded realm in which to practice and it provides opportunities for the Corps to develop new capabilities. Under IIS the Corps is precluded from responding to requests for proposals and from responding to requests for assistance when the potential client agency is known to be negotiating with a private firm for the same work.

The New York District services a wide array of IIS customer agencies with an inventory of projects reaching approximately $300 million in 2006. Customers include federal agencies such as the National Park Service, the Department of Homeland Security, and the National Oceanic and Atmospheric Administration; state agencies within New York and New Jersey; and agencies of New York City. Drawing on the Corps of Engineers' many areas of expertise, the district has assembled effective teams to provide these customers with a variety of services including dredging, environmental restoration, and building construction, as well as technical support in security vulnerability analyses, planning, and archaeology.

The district has three important IIS projects with New York City. One is an effort to assist the city in upgrading security to its 2,000-square-mile, nineteen-reservoir water supply system. New York City is renowned for the foresight it showed in building a system that holds 565 billion gallons of water, and provides up to 1.2 billion gallons a day of potable water to residents. At the same time, however, the infrastructure of a system so geographically widespread is difficult to protect. An $80-million project is developing engineering and construction solutions for specific areas where the water supply is vulnerable, as well as strategically located police stations equipped with electronic surveillance devices that monitor the system. The district has a second large-scale project with New York City to assist with security at a number of critical bridges. The third important IIS effort with New York City is the New York Hurricane Evacuation Study. For this project the Corps of Engineers has conducted hurricane evacuation studies to assist state and county emergency management agencies with their hurricane evacuation planning. Other ongoing studies by the district are evaluating warning systems and evacuation routes for Nassau, Suffolk, and Westchester counties.

A lot happens in thirty years. The period began as the district was adapting to both expanded obligations in environmental regulation and to the period of military quiescence that followed the end of the war in Vietnam.

No sooner did the district begin to make adjustments than the administration of Ronald Reagan reversed course in both areas. The Water Resources Development Act of 1986 changed the entire Corps of Engineers, seemingly permanently. The impact of the Fort Drum expansion was confined to the New York District, but it was a project of such massive scale that it shaped the district for many years. Following the completion of Fort Drum some retrenchment was necessary. This coincided roughly with important internal administrative changes and the gradual digitization of the work of the district. In the late 1990s environmental cleanup and restoration projects became a larger proportion of the Corps' workload. The chapters that follow describe the major projects that occupied the district's attention in the years 1975-2005, organized by broad categories of Corps activity.

Sources for Chapter 1:

In addition to the books, articles, and reports listed below, a number of formal interviews conducted for this project were important for this chapter. An extended joint interview with Samuel Tosi and Louis Pinata provided an overview of district activity in the 1970s, 1980s, and 1990s. Interviews with Frank Santomauro, Eugene Brickman, and Stuart Piken also clarified the overall evolution of the district in the years since the early 1980s. The interview with Arthur Connolly was particularly helpful on the Secaucus postal facility construction. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Beyond the formal interviews, informal conversations with many current and former New York District employees contributed significantly to this chapter. George Kalechitz, former captain of the district vessel Hocking, was kind enough to loan a large box, about three cubic feet, of material he had collected over the years.

The district has no central library or archives. Official district documents, such as reconnaissance, feasibility, and limited reevaluation studies, engineering-design-documentation, after-action and other reports, and general design memoranda, which provided much of the project-specific data, are scattered throughout several floors of the Jacob K. Javits Federal Building. At the time of writing there were four principal locations where many district reports could be found: the libraries of the Engineering Division, the Planning Division, the Environmental Analysis Branch, and the Programs and Projects Management Division. There is also a large collection of district publications at the Engineer Research and Development Center Library in Vicksburg, Mississippi. The majority of official Corps of Engineers publications consulted for this chapter, however, were found on the desks of district staff members involved with related or successor projects and were located with these staff members' generous assistance. Unofficial planning documents and other internal source materials, including draft reports, were sometimes consulted as well. Most of these were also gathered from the files of individual district staff members. Back issues of the *District Times*, the New York District's internal newsletter, which are kept by the Public Affairs Office, and of *Engineer Update*, the Corps of Engineers' monthly publication, proved helpful as well.

There are hundreds of local newspapers published within the district's boundaries. Few of these are indexed, and most newspaper's digital archives extend back only a few years. There was no systematic way to consult newspaper coverage of Corps of Engineers activity within the New York District, but using Proquest Historical Newspapers and LexisNexis Academic, a number of helpful newspaper articles were found. These are included in the bibliography below.

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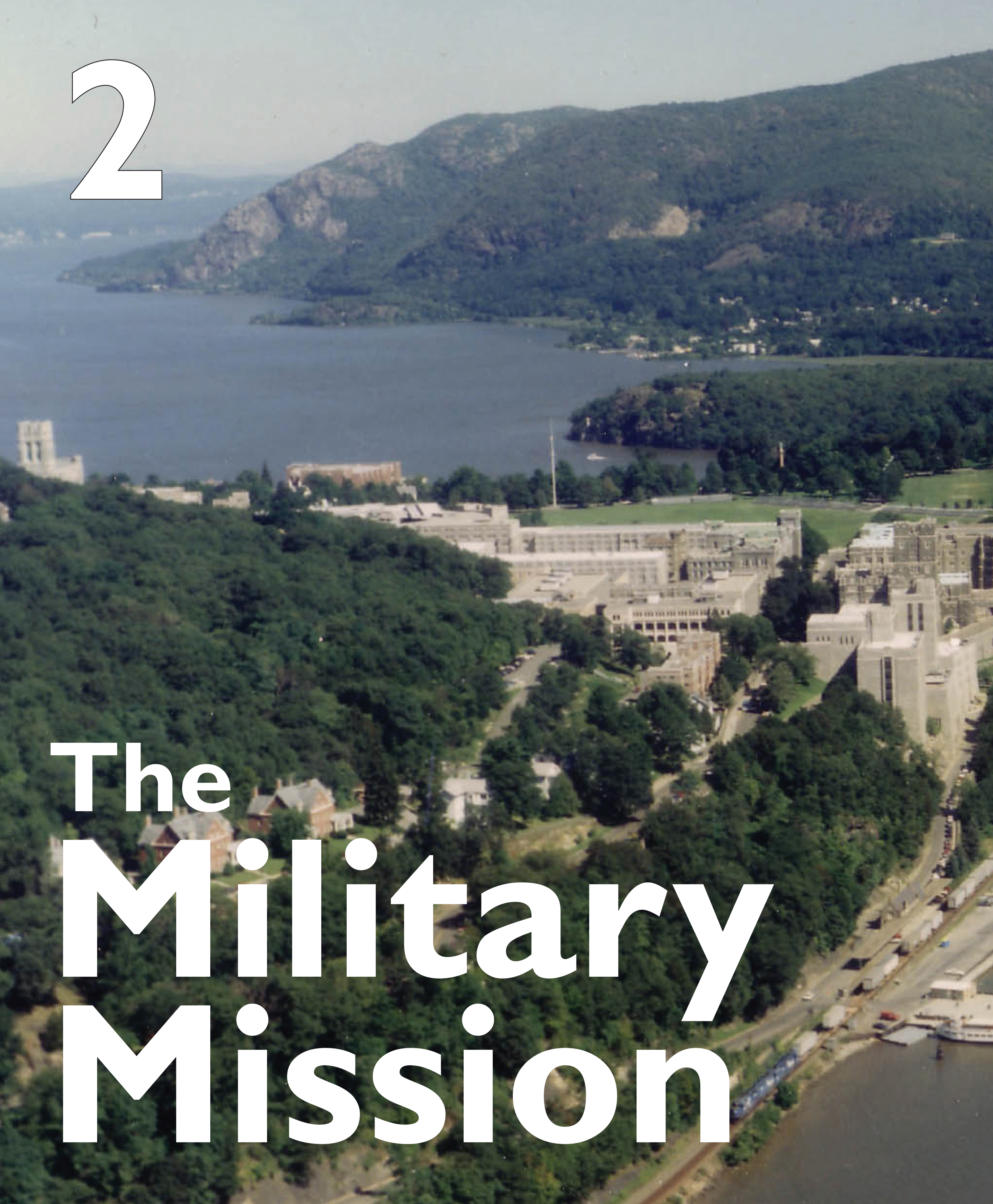
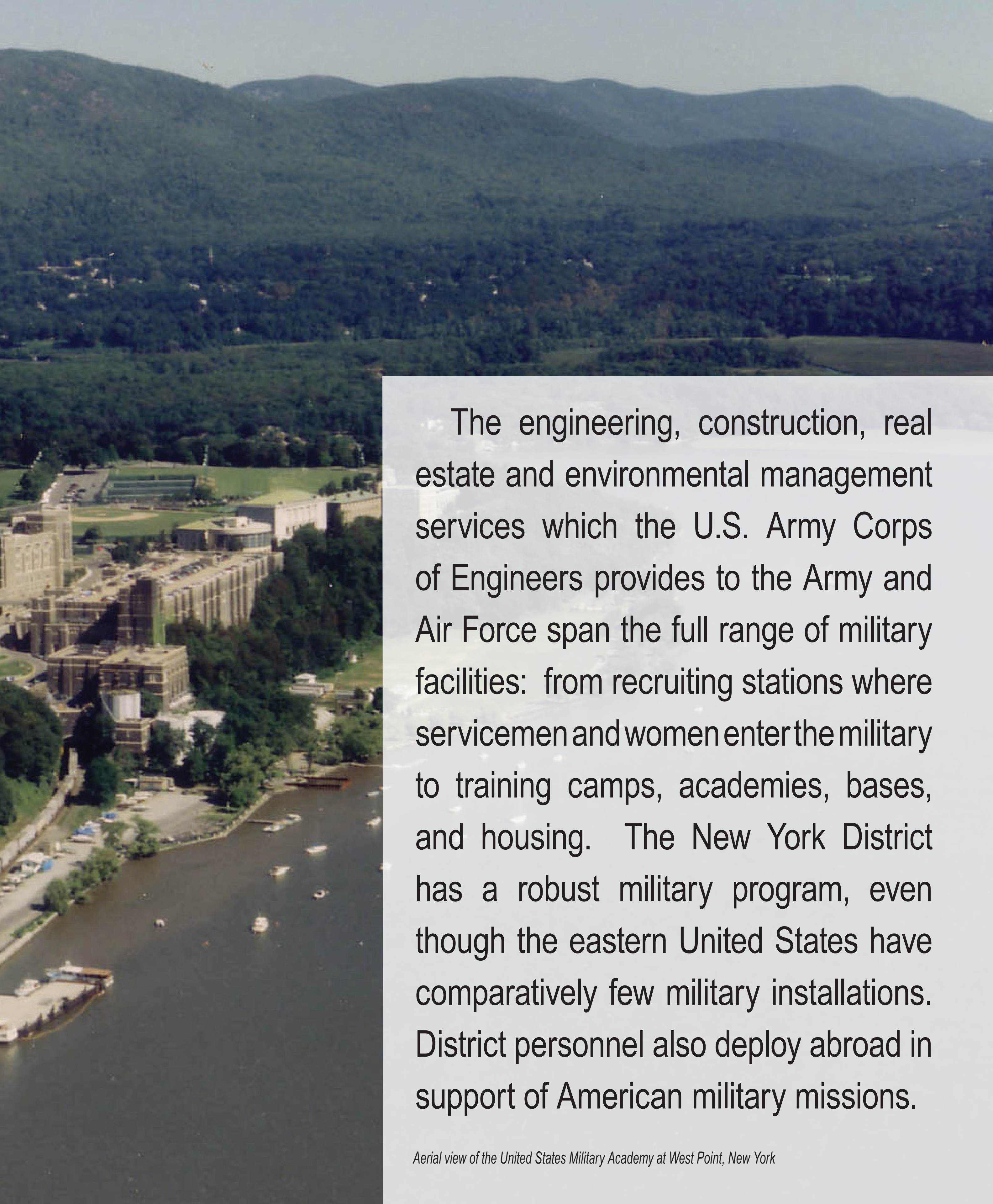
Stuart Piken, Deputy District Engineer for Programs and Project Management, New York District. Interviewed November 14, 2005, by Howard Green.

Frank Santomauro, Chief, Planning Division, New York District. Interviewed November 16, 2005, by Howard Green.

Samuel Tosi, Chief, Planning Division, New York District (retired) and Louis Pinata, Retired Chief, Construction Division, New York District (retired). Interviewed December 2, 2005, by Howard Green, Chris Ricciardi, and Carissa Scarpa.

2 The Military Mission





The engineering, construction, real estate and environmental management services which the U.S. Army Corps of Engineers provides to the Army and Air Force span the full range of military facilities: from recruiting stations where servicemen and women enter the military to training camps, academies, bases, and housing. The New York District has a robust military program, even though the eastern United States have comparatively few military installations. District personnel also deploy abroad in support of American military missions.

Aerial view of the United States Military Academy at West Point, New York

In 1975 the district's military boundaries covered eight states: the six New England states – Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island – plus portions of New York and New Jersey. In 1999 responsibility for construction management and environmental cleanup at the bases in the New England states was turned over to the New England District. Even after this transfer of responsibility the New York District's military program remained strong.

There are three reasons for this. One reason is the district's record of efficient and excellent service has resulted in it being selected for a number of important missions. The expansion of Fort Drum (described in Chapter 3) impressed upon the military establishment the capabilities of the New York District, while the rapid and efficient development of McGuire Air Force Base caused the Air Force, in particular, to look to the district for assistance on a number of important projects. Another reason is the many Army Reserve facilities in the region. In the mid-1990s, for example, the district was supporting 108 reserve centers in its eight-state region. The third reason is that New York is one of only two Corps of Engineers districts in charge of construction at a service academy. Missions of military bases typically change over time as military priorities and strategies evolve. Posts such as Fort Drum, Fort Monmouth, and McGuire Air Force Base expand or contract, sometimes on short notice or unpredictably. The Pentagon's steady commitment to the United States Military Academy at West Point, however, provides both a key military mission for the New York District and a steady flow of construction and maintenance work.

In general, the Corps of Engineers' military construction work follows the changing geopolitics of American foreign policy. The Department of Defense decides what facilities are needed and where they should be placed based on appropriateness of location and assessment of national military needs. This is unlike the civil works side where districts may be closely involved with local interests and Congressional representatives in defining a problem as well as shaping a solution.

The last thirty years have witnessed three events that shaped American foreign policy and Pentagon decisions about bases, troops, arms, and materiel: the end of the Vietnam War; the end of the Cold War; and the emergence of enemies with lethal capability who are not directly linked to nation states, i.e., global terrorism. The Vietnam War ended on April 30, 1975 when the last Americans and some supporters were airlifted from the American embassy compound in a Saigon overrun by the Vietnam Peoples Army. In the years after Vietnam there was little expansion of homeland military facilities, but the move to an all volunteer army led to an emphasis on improving the quality of life of enlisted men and women, which resulted in work for the district.

The end of the protracted struggle for global dominion between the United States and the Soviet Union, known as the Cold War, was gradual. It began with the

dismantling of the Berlin Wall, the Cold War's principal icon, in November 1989, and concluded with the collapse of the Soviet Union in 1991. The post-Cold War military environment led to district activity closing a number of Strategic Air Command bases and reconfiguring other posts.

The first significant deployment of American troops after the Cold War involved a number of district personnel. When war erupted in the former Yugoslavia, the North Atlantic Treaty Organization (NATO) led a multinational effort to restore peace. The Corps of Engineers deployed to the former Yugoslav republics of Kosovo and Macedonia in support of the NATO effort known as Operation Joint Guardian, which was aimed at preventing the ethnic cleansing by Serbs of Kosovar Albanians. A fifteen-member New York District team was among the Corps personnel who deployed. The team worked on Camp Bondsteel, a base for roughly 4,000 American service members that was built on 750 acres of former farmland in southwestern

Kosovo. Bondsteel served as headquarters for U.S. forces in Kosovo. District personnel designed forty-three structures of all kinds, including two large antenna towers, and they inspected bridges in the area to determine their structural soundness to support heavy military vehicles. They also assisted in the development of Camp Monteith, which was built on the grounds of a former Serbian artillery base that had been heavily damaged by bombing during Operation Allied Force. Camp Monteith, which housed approximately 2,000 members of the U.S. armed services, and Camp Bondsteel were the staging grounds for the bulk of the NATO-assigned U.S. forces stationed in Multi-National Brigade (East), nicknamed Task Force Falcon. In Macedonia, district personnel contributed to improvements at Camp Able Sentry, located near the Macedonian capital, Skopje. Able Sentry served as an intermediate staging area for all military forces deploying to the forward areas of Task Force Falcon.

The third major event of military significance in the last thirty years – the rise of global terrorism – differed markedly from the other two. The impact on the district of the terrorist attacks on the Pentagon and the World Trade Center on September 11, 2001 is described in Chapter 9. These attacks, and the ambitious campaign to "end international terrorism" that President George W. Bush announced in their aftermath, will shape the American military for years to come. But in late 2006 it is too soon to tell precisely how. The Pentagon named the military aspects of the President's program the "Global War on Terrorism" (GWOT). The effect the GWOT will have on the construction plans of the Department of Defense and in turn on the military work of the New York District can be expected to be felt well beyond 2006.

Camp Bondsteel, the main base of the United States Army in the United Nations-administered province of Kosovo, Serbia

The district has supported the Global War on Terrorism in a number of ways. A "Forward Engineering Support Team" deployed to Turkey in March 2003. A Forward Engineering Support Team (FEST) is generally made up of an army captain or major and a non-commissioned officer plus a group of eight civilian specialists in engineering, environmental science, global information systems, contracting and other areas. FESTs provide the full range of Corps of Engineers capabilities and can be ready to deploy worldwide within eight days to respond to any military contingency or civil emergency.

The Turkey deployment was known as FEST-A, an advanced team. In Turkey, the FEST-A's mission was to put infrastructure in place for incoming troops on which the team worked with the 18th Engineering.

New construction in progress at the Afghan Army military base of Pol-e-Charki in 2003

The first of roughly two dozen district personnel supporting the invasion of Afghanistan (known as Operation Enduring Freedom) reached Afghanistan a few months later. They provided support in many areas. Besides engineering, district personnel brought public information, contracting, legal, technical scientific (e.g., biological and archaeological), and other skills to Afghanistan. Some staff worked in their areas of expertise, others did not. Personnel from the marine terminal at Caven Point, ship captains and deckhands alike, deployed as Quality Assurance/ Quality Control representatives, and they recognized the incongruity of working in landlocked Afghanistan. District personnel provided engineering expertise at Bagram Air Base, a U.S. post, and they supported the Afghan National Army as well, with work on infrastructure projects such as roads and sewer, water, and electrical systems. Staff from the district also worked on construction of dining halls, hospitals, and headquarters, office, and storage buildings at the Darualaman and Pol-e-charki bases built for the expanding Afghan Army. At Darualaman the work involved overseeing the restoration and remodeling of abandoned Russian buildings, and construction of a dining hall, which then served as a model for the construction of similar facilities in other locations. These construction projects entailed working with Afghan firms as well as Turkish, Pakistani and American companies.

The Corps of Engineers involvement in Iraq, which in November 2006 amounted to 2,620 projects at a construction cost of $3.38 billion, began in support for two efforts: "Restore Iraqi Oil" and "Restore Iraqi Electricity." These were the first priorities because some of the Iraqi infrastructure was war damaged and all of it had suffered from years of poor maintenance and neglect. Gradually, the Corps took on other reconstruction projects, and besides oil and electricity, district personnel worked on water supply, police and military training facilities, fire stations, and public works such as roads, bridges, and sewers. They also provided various training and support services. More than fifteen district employees served in Iraq between 2004, when the Corps created the Gulf Region Division, and 2006.

Troop delivery and refueling tanker aircraft parked at McGuire Air Force Base, Burlington County, New Jersey

BASES AND INSTALLATIONS

McGuire Air Force Base, located adjacent to Fort Dix in Burlington County, New Jersey, is the New York District's largest and busiest military air facility. The base was established in 1947, when the Air Force was separated from the Army and the Fort Dix Army Air Force Base was renamed for highly decorated World War II fighter pilot Thomas B. McGuire, Jr.

During the Fort Drum years in the late 1980s and early 1990s construction work at McGuire Air Force Base became the responsibility of the Philadelphia District, but the New York District resumed oversight of work at McGuire after it was targeted for shutdown by the Defense Base Realignment and Closure Commission (BRAC) in 1993. The BRAC process was an effort to save money by closing, in whole or part, or realigning excess military installations. It was aimed at maximizing the efficiency of the armed forces in light of changing military exigencies. The BRAC initiative of 1993 was the third in a sequence that began in 1989 and by late 2006 included five discrete rounds (1989, 1991, 1993, 1995, and 2005). The Commission's first plan was to replace McGuire with an expansion at Plattsburgh Air Force Base and the district was assigned a mission from the Air Force to design new facilities there as quickly as possible. While the Congressional review was still under way, the district had architecture and engineering contractors at work designing new facilities at Plattsburgh. However, as a result of Congressional review, the Air Force decided that McGuire's central location on the Atlantic coast better situated it to serve as a major hub for cargo and troop transport. The revised BRAC recommendation was thus for the Plattsburgh functions to be relocated to McGuire rather than the other way around.

At McGuire the district was charged with building what was required to support twenty-four KC-10 aircraft, as well as adding an Air Force reserve tanker squadron and a reserve group headquarters. Other district building projects at McGuire in the 1990s included construction of a maintenance hangar, a fuel-cell maintenance dock, a corrosion control facility, two squadron operating centers, a medical clinic, 300 housing units, and one new and one rehabilitated barracks. Two-and-a-half thousand new people, including dependents, came to the base as part of the Air Mobility Command, whose mission was to provide rapid global mobility and support for the armed forces. After Fort Drum, the work at McGuire represented the district's largest military construction undertaking in the late twentieth century.

The centerpiece of the work was the $130-million KC-10 maintenance hangar complex. The KC-10 is an aerial, or in-flight, refueling tanker that has a significantly larger fuel capacity than the older KC-135, which it replaced. The KC-10 has been described as a DC-10 with a huge fuel bladder inside it instead of seats. The hangar complex, which uses differing bands of color and texture to make the massive structure appear smaller than it is, includes three service bays, each dedicated to a specific function – maintenance, corrosion control, and fuel cell upkeep – which wrap around a support core. The environmentally sensitive and energy efficient building won a Corps of Engineers design award in 1999. Another important project at McGuire during this period was the Air Mobility Operations Group warehouse that consolidated assets in support of four air squadrons and 546 troops. It was the district's first major project to use metric plans and specifications.

A KC-10 tanker aircraft refueling an F-16 fighter jet

The interior of the KC-10 maintenance hangar at McGuire Air Force Base, Burlington County, New Jersey

The district's work at McGuire in the 1990s featured more than twenty separate projects, but its building activity at the base did not end with the millennium. In the summer of 2003 there were eleven projects under design or construction. Here, too, the most notable project centered around a new airplane: the C-17 Globemaster III, which replaced the C-141 Starlifter. The C-17 is a strategic airlifter built by Boeing that can deliver troops and cargo to main operating bases, or directly to forward bases in a deployment area, because it can take off and land on a comparatively short and narrow runway. Flown by as few as three crew members, the C-17 carries more than twice the weight the C-141 can handle, and it is capable of tactical airlift and airdrop missions. For the C-17s to be housed at McGuire, the district oversaw a $60-million construction project that included a maintenance hangar, repair shops, and a flight simulator.

A C-17 Globemaster III strategic airlifter flight simulator at McGuire Air Force Base, Burlington County, New Jersey

The Air Force partnered with the district on another contract in the spring of 1998. The recently created Air Force Services Agency, which manages money, known as "non appropriated funds," that has been collected from revenue generating operations such as bowling alleys or golf courses, engaged the district to design and manage construction of a series of Air Force temporary lodging facilities. This is housing rented at below-market rates for up to thirty days to military families in transit. As part of this nearly $100-million program, the district oversaw the building of 440 new units and renovation of another 240 units at seventeen Air Force bases around the world, including new units at Davis-Monthan Air Force Base in Arizona, Hickam Air Force Base in Hawaii, and the Air Force Academy in Colorado Springs, Colorado. The district also oversaw renovation of units at Elmendorf Air Force Base in Alaska and Kadena Air Force Base in Japan.

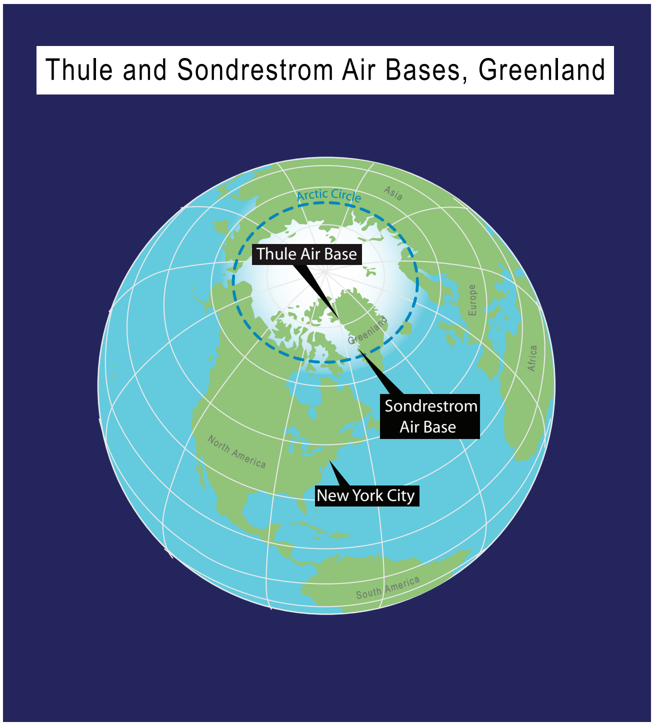
For sheer technical complexity few military construction projects match the work carried out by the New York District at the **Thule Air Base** in Greenland. Military installations at Thule (pronounced *too-lee*), located in northwestern Greenland roughly 700 miles south of the Arctic Circle, and less than 950 miles from the North Pole, were built during World War II, following the German occupation of Denmark. (Greenland is a self-governing Danish territory.) In 1951, early in the Cold War era, bombers were staged at Thule to extend American nuclear strike capability. Ten years later radar was installed as part of a ballistic missile early warning system. Today it is home to the 821st Air

A rendering of Air Force temporary lodging facilities

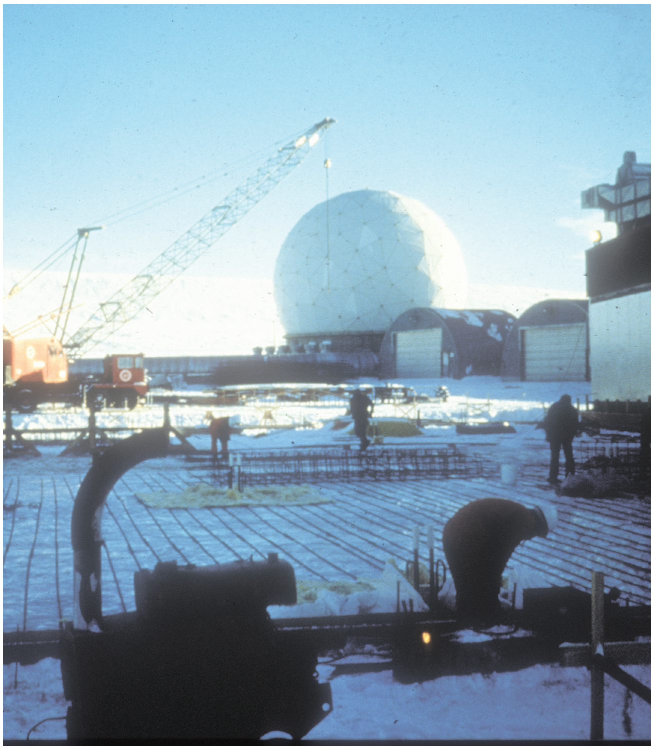
Base Group, the 12th Space Warning Squadron, and Detachment 3 of the 22nd Space Operations Squadron, part of the 50th Space Wing's global satellite control network.

Outdoor construction at Thule is confined to a four-month season from mid-May to mid-September, when temperatures reach above 40 degrees Fahrenheit. During the rest of the year the weather is too severe to work outside. Most of the year Thule is ice-bound, but in July and August it is possible for the base to receive construction materials by sea because the frozen shipping lanes can be broken up. Supply ships, however, must still navigate carefully around icebergs.

From 1986 to 1990 the New York District operated a Greenland resident office at Thule, from which it oversaw some $90 million in construction activity. Projects included a cogeneration plant (producing both heat and electricity), an administrative building, an air traffic control tower, a dormitory for security police, a food storage facility, and a fire station. When the resident office closed, it compiled a "Lessons Learned" report so the knowledge the district had acquired about arctic engineering would not be lost. This was put to good use in 1994 when the district built a 10,000-foot-long runway for the 12th Space Warning Squadron. By this time the population of the base was down to about 1,000 personnel from a peak in 1961 of roughly 10,000. The runway job, which was designed to be built over five summer construction seasons, also included taxiways, new living quarters, a fire training facility, and, most recently, a new medical center, which opened in winter 2005. This medical center provides outpatient care, surgical services, and digital x-ray services to west Greenland communities as well as to the few hundred base personnel.



Air strip at Thule Air Base, Greenland



Construction in progress at Thule Air Base, Greenland

Sondrestrom Air Base was situated in southwestern Greenland roughly 700 miles from the Thule Air Base. Just north of the Arctic Circle and about sixty miles inland of the coast, Sondrestrom's main purpose was to support the Distant Early Warning (DEW) system, a Cold War-era chain of radar stations. The 3,000-mile-long DEW system comprised a line of integrated radar and communications positions that stretched from northwestern Alaska to Greenland and were designed to protect North America from Soviet air strikes. Sondrestrom also had a Strategic Air Command (SAC) mission, in support of which the district extended the runway to accommodate SAC planes and took steps to stop deterioration caused by permafrost melt.

Sondrestrom supported two elements of the DEW system: DYE-2, one hundred nautical miles out on the polar icecap, and DYE-3, one hundred nautical miles beyond DYE-2. Named for Cape Dyer in Canada, the DEW stations known as DYE-Main, DYE-2 and DYE-3 went into operation in 1961. Staffed by private contractors who signed on for one-year terms, the radar stations were completely dependent on supplies from Sondrestrom, which was home to two C-130s from the 17th Tactical Air Squadron. The C-130 is a large four-engine turboprop cargo aircraft designed in the early 1950s to transport troops and supplies. The two airplanes at Sondrestrom were equipped with skis, and were known as "skibirds."

In the late 1950s, the Corps built the unique radar buildings at DYE-2 and DYE-3. These had their radar and electronics equipment on the upper floors with crew quarters, including a mess hall and recreation areas directly below them, and a warehouse, garage, and mechanical room on the bottom floor. The buildings, which sat above the surface of ice and snow, were capable of jacking themselves up during blizzards to allow wind-driven snow to blow under them. Drifting snow could otherwise damage or even bury the buildings. Their foundations were truss systems that extended thirty feet below the snow surface and could correct for any uneven settlement of the footings. During the 1970s and 1980s, the district's work at Sondrestrom included building barracks and remodeling hangars before its work there came to an end when the post closed in 1992.

The impact of the Cold War was particularly evident on the Strategic Air Command (SAC) which, from 1946 until 1992, operated the Air Force strategic nuclear facilities. There were several SAC facilities located within the New York District's military boundaries. In 1991 the Secretary of Defense accepted the Defense Base Closure and Realignment Commission (BRAC) recommendation to close six SAC bases, four of which were supported by the New York District – three in New England states and one in New York. In the mid-1970s the district had work under way at all four of these locations.

Westover Air Force Base in Chicopee, Massachusetts, was a staging area for the Berlin Airlift in 1948-49 and a major SAC installation. Its 300-foot-wide, two-mile-long main runway was built to accommodate B-52s, the big Cold War-era strategic bomber. Westover, which closed within a few years of the end of the Cold War, is now Westover Air Reserve Base/Metropolitan Airport, a joint-use military general aviation airport managed under an agreement with the Department of Defense. Westover Air Reserve Base is the country's largest reserve base, home to reserve units of all four service branches. In 1995 the district completed a makeover that turned the hydrant refuel facility at Westover into one of the Air Force's largest refueling centers. Prior to the project one plane required ten trucks to refuel it; subsequent to the renovation Westover could refuel four planes simultaneously.

Pease Air Force Base in Portsmouth, New Hampshire, was another SAC base during the Cold War. It was closed in 1991, the first major installation to be closed by the Defense Base Closure and Realignment Commission. The BRAC process included a congressionally mandated program to provide financial help to families that were forced to sell their houses due to base closures or reductions. When Pease was targeted the district's real estate office at Fort Devens ascertained that housing values in the region dropped more than 5 percent due to the closure of the base. This qualified their owners for the Department of Defense's Homeowners' Assistance Program, which provided some financial help to families forced to sell their homes because of base closures or realignments. In 2006, parts of the base were still in operation as a United States National Guard tanker base.

Loring Air Force Base in Limestone, Maine, was a Cold War facility from start to finish. Activated in 1953, it was the closest base in the continental United States to the Soviet Union west of the Ural Mountains, and the second largest air force base in the country during its time in service, serving primarily as a home to strategic bombers. During the 1980s the Pentagon spent nearly $300 million upgrading facilities at Loring, which generated work for the district. When Loring was officially deactivated in September 1994 most of the cleanup was done by the Air Force Center for Environmental Excellence, but the district managed a few projects as well. It led a cleanup outside the weapons storage area on the east base, and carried out a number of projects that involved replacing contaminated soil with clean fill. This work required removing a number of above-ground refueling structures, roughly twenty underground tanks of 50,000-gallon capacity, and miles of subsurface fuel pipes. The district used "land farming," in which excavated soil was spread out on pavement and periodically aerated by turning it over with a farm tractor until it was clean enough for reuse. The district also remediated a bulk tank farm by cleaning a number of tanks and the piping leading to the tanks. This piping included an approximately 200-mile-long transmission line that ran from a pier in Searsport, Maine, to the tanks at Loring. The district also installed individual heating systems in numerous buildings that were going to remain in service after the base's central heat plant was eliminated.

Plattsburgh Air Force Base in Plattsburgh, New York, about fifteen miles northwest of Burlington, Vermont, across Lake Champlain, became the Plattsburgh International Airport in September 1995 when the base closed, the result of the BRAC cycle of 1993 outlined above within the context of McGuire Air Force Base. The last functional military aircraft left Plattsburgh in 1991. Some consider it to have been the longest active military installation in the United States.

It was not only SAC facilities on which the district worked in the late 1970s and early 1980s that disappeared from the military scene. The Pentagon was also reassessing other priorities. For example, other facilities within the district's military boundaries that wound down their operations in the late twentieth century included the Military Ocean Terminal at Bayonne, New Jersey, which closed in 1999, and the U.S. Army base at Fort Devens in Ayer, Massachusetts, which officially closed in 1996 after nearly eighty years of operation.

The sprawling base at **Fort Monmouth** in Monmouth County, New Jersey has also provided much work for the district over the last thirty years, although in 2006 it faced closure. In the early 1970s the district built a hospital at Fort Monmouth. In 1976 the United States Military Academy Preparatory School moved there. West Point Prep, as this institution is known, trains approximately 250 students per year to enter the United States Military Academy at West Point as freshmen. In 1981 a number of commands were reorganized to create the Communications-Electronics Command (CECOM), headquartered at Fort Monmouth, and the fiscal 1982 budget included $28.3 million for research facilities at the fort to accommodate CECOM. The BRAC initiative of 1995 also consolidated a number of electronics functions at Fort Monmouth, which led to $47 million worth of work for the district on four projects for the Intelligence and Electronic Warfare Directorate, Research and Development Facility. The planning and design for this facility were done at an accelerated pace to meet the compressed schedules established by law.

More recently, the Fort Monmouth facility was expanded in other ways. The district built a Youth Activity Center in 1993 and a Child Development Center that accommodates nearly 250 infant to pre-kindergarten children in August 1996. A major series of renovations to family housing at Fort Monmouth concluded in 1995 with improvements to 124 units in fourteen Wherry family housing buildings.

Residences at Fort Monmouth, Monmouth County, New Jersey

A two-story laboratory and administrative offices building that included an "anechoic-shielded chamber" to absorb sounds was dedicated in July 1997. The front portion of the commissary, which also served the nearby Naval Weapons Station in Earle and the Coast Guard facility at Sandy Hook, collapsed during a storm in January 1996. Its replacement was finished in 1998. While the post-Cold War BRAC process spared Fort Monmouth, and even fostered its expansion, in 2005 the base was slated for a complete shutdown. The closure will lead to some additional work for the district, including, for instance, the relocation of West Point Prep to West Point.

ARSENALS, RESEARCH LABORATORIES, AND SUPPORT FACILITIES

Some of Fort Monmouth's loss will be **Picatinny Arsenal**'s gain. Picatinny covers a little more than ten square miles of highland terrain in Rockaway Township, Morris County, New Jersey. It is famous for developing the Picatinny rail, a standardized bracket for mounting scopes and other accessories on firearms. Through the Vietnam War years Picatinny manufactured explosives, propellants, and ammunition. In 1977 the Arsenal ceased manufacturing munitions in favor of a focus on research and development when it became the headquarters of the Army's Armament Research and Development Command (ARRADCOM). Virtually all of the lethal mechanisms used in U.S. Army non-nuclear weapon systems are developed at Picatinny. A recent estimate put the figure at 95 percent, a figure that could even increase when some of the research and development functions from Fort Monmouth are transferred here.

In May 1982, when a new $11-million administration building was opened, Picatinny Arsenal had a staff of 6,400 civilian and 170 military personnel. It was the largest single-location employer in northern New Jersey, and an ambitious $50-million program of expansion, renovation, communications systems modernization, and energy conservation improvements was in the offing. Much of this would mean work for the district. The following year, for example, New York awarded a $400,000 contract to design a new research laboratory, and in April 1985 it solicited bids on a water treatment plant upgrade estimated to cost between $1 million and $5 million.

General view of Picatinny Arsenal, Morris County, in the New Jersey Highlands

In 1986, when Picatinny Arsenal became the U.S. Army's Armament Research, Development and Engineering Center (ARDEC), its primary mission remained research, development, and prototype production of explosives and propellants. In June 1987 ARDEC was Morris County's largest employer, and was considered the best research and development center in the Army. With an annual payroll of $150 million and an annual production budget of more than $1 billion, it fielded thirty-two prototypes and fourteen finished items. The district completed the $11-million Armament Technology Facility, a 53,000-square-foot building for indoor testing of weapons and projectiles in May 1995; it upgraded this facility, which can conduct tests for systems as large as the Abrams tank, in 2003.

Any installation like Picatinny will have hazardous waste to manage. As far back as 1972, serious deficiencies in the arsenal's water pollution control procedures were identified, but little was done to remedy the problem. In June 1988 Picatinny Arsenal was criticized by the Environmental Protection Agency for "chronic non compliance" with various environmental standards, the same month that the House Energy Oversight Subcommittee named it as one of sixteen federal facilities with widespread deficiencies in handling hazardous wastes. The subcommittee report cited fifty-four hazardous waste sites at Picatinny, and warned that water beneath the site, which is situated above an aquifer that provides the only source of drinking water to surrounding communities, was contaminated with a variety of dangerous chemicals and heavy metals, including cadmium, chromium, cyanide, lead, toluene, and phenol. In response the arsenal worked with the Corps of Engineers' Huntsville District, which identified more than one hundred sites that required further evaluation. The work done by Huntsville laid the basis for the remediation carried out by the New York District beginning in 1990. From 1991 through 1995 the New York District closed more than eighty facilities. The projects ranged in size from cleaning up floors where toxic spills had occurred to the complete decontamination and demolition of buildings that had been part of the abandoned explosives production operation. In some cases this involved remotely operated tools and ballistic safety equipment.

In addition to the problems cited by the House subcommittee, serious contamination was also found at a landfill on the Picatinny Arsenal property. In 1995 the district cleaned up an abandoned drum disposal area, from which more than 300 containers that could have been sources of groundwater contamination were removed. The Huntsville District was also responsible for design and construction of a groundwater treatment plant that treated for trichloroethylene, a commonly used industrial solvent. The entire cleanup, though it preceded the official policy announcement, was done in a manner consistent with the Army's four-pillar environmental strategy, which was released in late 1993.

Picatinny Arsenal's commitment to a high quality of life for its workforce has generated considerable work for the New York District. For example, discussion in the mid-1990s concerning what to do about an obsolete and

THE FOUR PILLARS OF ARMY ENVIRONMENTAL STRATEGY

In late 1993 the Army issued a four-pillared environmental strategy:

Compliance - Develop, as an immediate priority, a sustained compliance with all federal environmental laws

Restoration - Continue to restore previously contaminated sites as soon as possible as funds allow

Conservation - Conserve and preserve cultural and natural resources so they will be available in the future

Pollution Prevention - Focus efforts to reduce or eliminate contamination at the source

dilapidated swimming pool led to the creation of a water park when the Community and Family Support Center agreed to shoulder two thirds of the nearly $4 million cost of the project. The Seattle District managed the project, which was finished in 2000, with New York District staff providing field support. The final product has 12,000 square feet of pool surface, two waterslides, a kiddy pool, and other features. In 2002 the district built a thirty-unit housing project known as Spicer Village around the new water park. The new homes replaced substandard pre-World War II housing and were supplemented with a newly renovated community center.

The district's recent work at Picatinny does not involve only quality-of-life improvements. In June 2004 the arsenal broke ground on a seventeen-building, multi-function, high-energy propellant facility. There were two out-of-the-ordinary aspects to this project. Usually contracts are let separately for design and construction, but in this case the project delivery team, which included representatives of the Corps of Engineers districts in Omaha and Norfolk under New York District leadership, felt that combining the contracts made sense because of the very specialized nature of the work. The combined $16.5-million design/build contract went to a Brooklyn-based firm certified by the Small Business Administration. Ordinarily small business set-aside contracts are smaller than this, but the greater New York area offered enough certified small businesses competent to bid on this project, so the large contract amount was possible. This new facility will provide a secure environment for the Army to develop and

Water park at Picatinny Arsenal, Morris County, New Jersey in the late 1990s manufacture the fuel used to ignite armaments. The district is also building the Explosive Research and Development Loading Facility at Picatinny, which the Army will use to develop and improve explosives in a secure environment.

In 2005 the most recent round of Defense Base Closure and Realignment Commission proposals recommended that a number of gun and ammunition research, development, and acquisition facilities be relocated to Picatinny from bases around the country, including Fort Monmouth. Picatinny was already the main center of research and development of weapons and armaments in the Department of Defense when these recommendations were made. Congressman Rodney Frelinghuysen, who at the time was the Vice Chairman of the House Defense Appropriations Committee, in whose district Picatinny Arsenal is situated, estimated that these moves would add up to 600 new jobs at the base.

The Picatinny Arsenal Advanced Warhead Development Facility, Morris County, New Jersey

The other arsenal within the district's military boundaries did not lose its manufacturing during the BRAC process. To the contrary, **Watervliet Arsenal**, on a 142-acre site just north of Albany, New York, is the Army's primary gun-tube maker, the nation's sole facility for manufacturing large quantities of large-caliber cannons. A component of the Army's Armament Research and Development Command, Watervliet has a complex of seventy-two buildings with over 1.2 million square feet of manufacturing space. Large cannons are the arsenal's principal product, but the site also produces autoloaders and other components of the Army's main battlefield tank, the M1A1 Abrams, as well as cannons for U.S. Navy warships, rocket motors, mortars, and recoilless rifles. Watervliet has been the site of a number of New York District projects over the years, many of which have involved support services (such as the fire protection system the district designed in the early 1970s), while others have improved the efficiency of the facility's core functions (such as an industrial modernization project undertaken in the late 1970s).

One theme that links many of the district's recent military projects is the increasing technological sophistication of warfare. A good illustration of this is a $350-million project called REARM (Renovation of Armament Manufacturing), with which the district was involved from 1982 to 1992, that turned Watervliet Arsenal into one of the most sophisticated heavy manufacturing centers in the world. Project REARM included new construction, retrofitting old buildings with new equipment, and computerized integration of the entire manufacturing

Aerial view of Watervliet Arsenal near Albany, New York, including the Benet Weapons Laboratory (red roof in foreground) and several weapons manufacturing facilities

process. In 2005 the BRAC recommended a significant scaling back of activities at Watervliet. Its major mission of manufacturing tank armaments would continue, but production of other field artillery components will cease if the BRAC recommendation is adopted.

Another project was smaller, but it garnered the New York District an award. In the mid-1990s the district modernized a climate control laboratory at the U.S. Army Soldier Systems Center in Natick, Massachusetts. The **Natick Soldier Center** develops everything a soldier wears, carries, or consumes: from food and clothing to protective equipment and shelters. The district upgraded the laboratory's extreme conditions (i.e., tropical and arctic) research facilities. Based on a nomination from the Natick facility, which was extremely satisfied with its work, the district was recognized as the 1994 Installation Support District of the Year by the Army's Center for Public Works.

The **Seneca Army Depot** is located in upstate New York's Finger Lakes region, on nearly 10,600 acres of upland between Seneca and Cayuga lakes. Beginning in 1941 the Army stored and disposed of military explosives at this facility, but in 1992 most of the depot's missions were removed and the New York District closed its resident office at Seneca. Between 1976 and 1992, the district averaged $4 million a year in construction projects at Seneca, including the Ronald Lee Kostenbader Physical Activity Center, opened in 1981, whose lower level contained an indoor rifle range. In 1989 the Seneca Army Depot was placed on the Environmental Protection Agency's National Priority (Superfund) List, and in 1994 the Army identified 72 sites there as suspected environmental hazards. These were assigned priorities for cleanup based on hazard-ranking criteria developed by the EPA in consultation with the Corps of Engineers and other agencies.

In 1995, when the Seneca depot was placed on the Base Realignment and Closure list, the district opened a project management office in support of the BRAC process. Between 1996 and 2006 the district was involved with $85 million worth of environmental investigations, designs, and cleanups at ninety-eight separate locations within the sprawling depot. The work, which made use of Corps of Engineers teams from the Omaha, Huntsville, Baltimore, and New England districts for technical and contract support, involved a variety of environmental sites. Among them were incinerators for small arms ammunition, open burning and detonation sites for large munitions, hazardous and radioactive waste handling areas, areas used for storing uranium from the Manhattan project, and other facilities.

Closure of the depot, which has involved the real estate division in some pioneering environmental easements and other land use controls, was underway in late 2006. Parcels are transferred as they are cleaned up and accepted by the Seneca County Industrial Development Agency. In late 2006 there remained several million dollars of cleanup projects to complete.

The **Fort Hamilton** garrison is located at the foot of the Verrazano-Narrows Bridge in southwestern Brooklyn. Surrounded by the residential neighborhoods of Bay Ridge, Dyker Heights, and Bensonhurst, it is the only active Army post in the New York metropolitan area and home to a handful of functional units including the New York City Recruiting Battalion, the North Atlantic Division of the Corps of Engineers, and several Army Reserve and National Guard units.

With the exception of building a new education center at the post, the district did little work at Fort Hamilton for many years until command was transferred to the Military District of Washington in 1997. Since then, the district's work at the fort has run the gamut of Corps of Engineers' military responsibilities, including construction, maintenance and repair, real estate work, environmental studies, remediation, and contracting support. The district's first project after the Military District of Washington took over at Fort Hamilton was the preparation of a master plan for the post. This was followed in short order by construction of a new commissary.

In 1999, the district privatized Fort Hamilton's utilities. It transferred ownership of the post's electric, natural gas, potable water, and waste water distribution systems, under a multi-million dollar contract, to the Enron Corporation, which was to operate and maintain the systems for ten years. This was the Army's first bundled utilities privatization arrangement, and it earned the district an honor from the Military District of Washington. Early in the new millennium, the district renovated the historic YMCA facility as the garrison's command headquarters, and it replaced the roof of the officer's club.

In 1995 the Base Realignment and Closure Commission targeted two sub-installations of Fort Hamilton for closure: Fort Totten, primarily a housing post, and the seventeen-acre Bellmore facility, which had been used by the army for logistical activities and vehicle maintenance. At Bellmore the district oversaw the work of contractors who cleaned up drainage ditches and removed contaminated soil. A 200-gallon gas tank from World War II was removed from the site of a former fueling station; some 100 and 150 thousand gallon fuel tanks and dry wells were also removed. Because homeowners in the residential neighborhood that surrounds the facility were concerned about the contamination, the perimeter of the facility was carefully tested, but no contamination had leached into the surrounding area. Some contamination from lead-based paint was also found and removed. The work at Bellmore was completed in 2002, shortly after which the property was sold to a local developer who leveled the site.

At the 120-acre Fort Totten facility, the goal was to turn ninety acres over to New York City, some of which would be used by the fire department for classroom training. A ten-acre portion of Fort Totten, which had been under the control of the Coast Guard since the mid-1960s, was the location of torpedo and mine testing at the turn of the twentieth century. This placed a part of the cleanup at Fort Totten under the Formerly Used Defense Sites (FUDS) program, although in the end no cleanup was required because the release was so long ago that the sediments were by this time too deeply buried to require remediation. At a number of locations monitoring determined that neither groundwater nor soil had been contaminated so no cleanup was required. In three locations some soil that had been contaminated required removal, including one where there had been a prior removal of fuel tanks. All the work at Fort Totten and Bellmore was completed by 2004.

After this BRAC-related work was finished, demolition of three buildings at Fort Hamilton followed. By 2006 construction of a military police station, security-related improvements to access gates, and plans for a new Armed Forces Reserve Center were under way. The district's Fort Hamilton office also continues to provide substantial engineering services support to the New York City Department of Public Works on an as-needed basis.

Finally, **Hanscom Air Force Base**, located in the high technology belt along Route 128 outside Boston is home to the Air Force's Electronic Systems Center, where command and control systems are developed. Center programs design automated systems for air tasking orders, weather, and mission planning, among other functions, and the New York District supported many of these missions before Hanscom was transferred to the New England District. In 1994, however, the district was still supporting the families at the base. In November it completed a nearly $5-million Child Development Center that houses infant and preschool programs, which won that year's U.S. Air Force Interior Design Award.

RECRUITING STATIONS

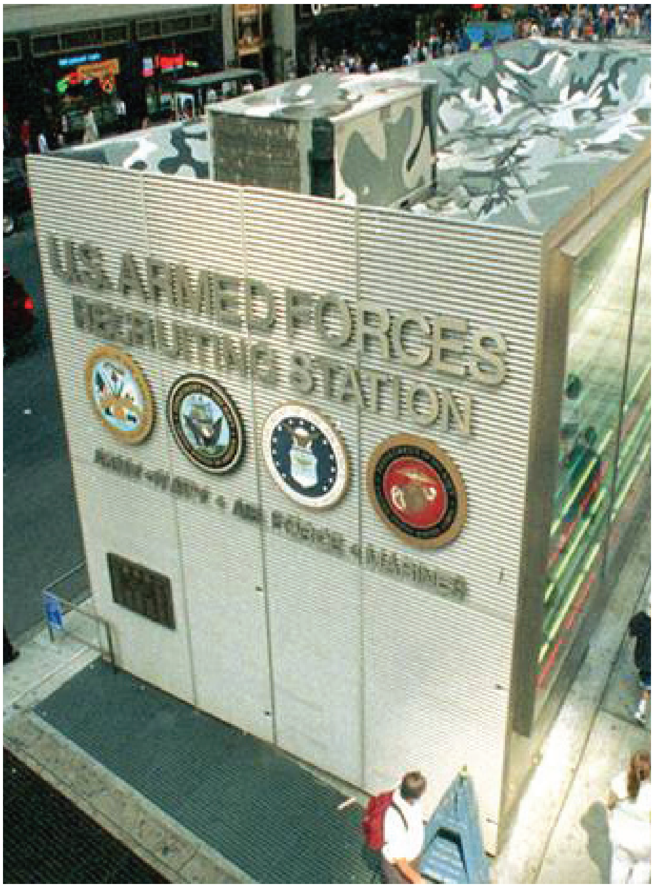
The Selective Service System abandoned conscription in favor of an all-volunteer military shortly before the war in Vietnam ended, and the impact of this on military spending was immediate. During the 1974 federal fiscal year nearly three quarters of the national military construction budget went to projects that supported the volunteer, or perhaps more accurately, professional army by enhancing facilities where soldiers, lived, worked, played, and received medical care. An obvious result of the move to an all-volunteer force, and the need for volunteers, was an increased emphasis on recruitment. In 1977 a team led by district engineer Colonel Thomas C. Hunter pioneered a new concept of "office landscaping" for recruiting stations that had two purposes. It could reduce the cost of the facilities, but more importantly, recruiting stations "in step with the present" could give impetus to the volunteer army by making recruiters' workplaces look like modern offices. With movable partitions to which desktops and drawers were attached, each branch of the armed services would have its own recruiting space, but an appearance of cooperation would be displayed as well. Utility lines would be easier to run and by making less physical impact on the space it would be easier to vacate without incurring charges from the landlord.

Work on the military bases tends to receive most of the attention when the district's military mission is under review, but the role of the military recruiting stations is by no means small. In the fall of 1997, for example, the Real Estate Division serviced 368 leases for recruiting stations in the eight states then within its jurisdiction, and following the destruction of the World Trade Center four years later, one of the district's first tasks was to find alternative space for two facilities put out of commission by the twin towers' collapse. The district is also responsible for the most famous recruiting booth in the country, the **U.S. Military Recruitment Center in Times Square,** which provides the American military with a steady stream of applicants for service. The Army first built a "cottage" for recruiting in Times Square in 1946, which it replaced in the early 1950s with a more permanent 360-square-foot structure. In 1977 the district oversaw a complete renovation of the facility, but it required refurbishment in 1980 after it was badly damaged by a fire allegedly set by an unidentified, underground, anti-military organization. The next decade and a half saw periodic small-scale improvements to the facility, including, for example, the installation of energy-efficient exterior glass in 1991.

In the spring of 1998, when the Times Square recruitment center was still using furniture from the 1950s, a major upgrading of the premises was announced. Since the early 1990s, Times Square had been undergoing a transformation, its seedy and disreputable character being supplanted by a series of new office buildings, theaters, stores, and tourist- and family-friendly commercial operations. Army recruiters did not want to relocate. As a symbol, and as the most successful walk-in station in the country, the Times Square recruiting booth was important to the American military effort. The Joint Recruiting Facilities Committee initially approached the district about developing plans for the renovation of the Times Square facility. The district then designed and built a steel and glass structure above a subway station on a traffic island at the intersection of Broadway and Seventh Avenue. The new recruitment center accommodated all four branches of the armed services and was consistent with the vision for the neighborhood of the Times Square Business Improvement District, a coalition of businesses that was leading the redevelopment of the area.

The renovation was not the end of the district's efforts to keep the recruiting station consistent with the new Times Square, where older neon signage was being displaced by larger and technically more sophisticated displays called "spectaculars." In May 2003 the district premiered the Pentagon's "spectacular": a giant video screen that occupies half of the southern exterior of the recruiting building and conveys text and images twenty-four hours a day.

The Times Square Recruiting Center in mid-town Manhattan in the mid-1980s



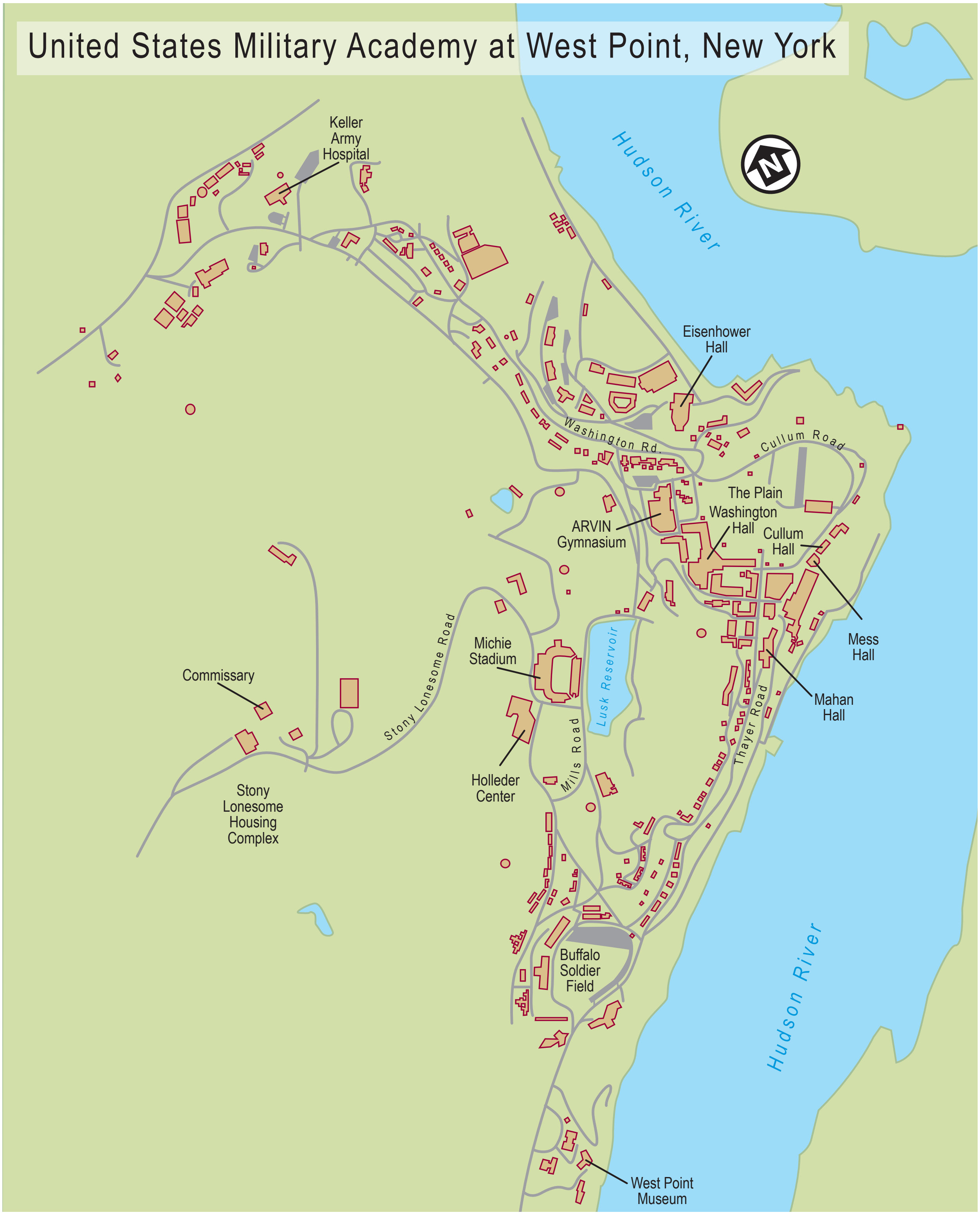
The re-built Times Square Recruiting Station, Manhattan, circa 2000

The "Spectacular" at the Times Square Recruiting Station, Manhattan, circa 2000

WEST POINT

The United States Military Academy at West Point is located approximately fifty miles north of New York City on a scenic overlook of the Hudson River. West Point's campus occupies only a small portion, roughly 15 percent, of its nearly 16,000-acre property. Its facilities include the usual academic buildings, dormitories, and sports facilities found at a university, as well as a ski slope, artillery range, and other things not typically encountered on a college campus. The campus lies entirely within a historic district known officially as the United States Military Academy National Historic Landmark. Its central feature is a flat, broad landscape, called "the plain," around which many of the academy buildings are situated.

The mission of the academy is "to educate, train, and inspire the Corps of Cadets ... to the values of Duty, Honor, Country" and to prepare its graduates for service to the nation. Building and renovation at West Point in support of this mission have provided a steady stream of work for the district in the past thirty years. In fiscal year 1999, for example, there were thirteen active projects worth roughly $40 million, while on average the New York District's construction program at the academy has been worth roughly $30 million a year. The district maintains an area office at West Point, which is responsible for all engineering and administrative services at the academy, as well as at other military facilities in New York State and northern New Jersey, with one exception. As the next chapter explains, in the late 1980s Fort Drum had its own



United States Military Academy at West Point, New York
Keller Army Hospital
Hudson River
Eisenhower Hall
Washington Rd.
Cullum Road
The Plain
Washington Hall
Cullum Hall
ARVIN Gymnasium
Mess Hall
Michie Stadium
Lusk Reservoir
Stony Lonesome Road
Commissary
Mahan Hall
Thayer Road
Mills Road
Holleder Center
Stony Lonesome Housing Complex
Buffalo Soldier Field
Hudson River
West Point Museum

area office due to the volume of work while the post was undergoing a major expansion. In the early 1990s as work slowed down there, responsibility for Fort Drum returned to the West Point area office.

Since the designation of the academy as a National Historic Landmark in 1960, and passage of the National Historic Preservation Act of 1966, renovation and construction activities within the main academic area have had to take into consideration the historical significance of the buildings and their placement in the landscape. These considerations have often led to additional challenges and opportunities in the design, upgrade and construction of West Point's campus. A few of the district's more notable undertakings at West Point are highlighted below.

In 1964, President Lyndon B. Johnson signed legislation increasing the strength of the Corps of Cadets at West Point from roughly 2,500 to just over 4,400. District-run projects in support of this expansion included: remodeling historic Washington Hall barracks; constructing Mahan Hall, an academic building, which was finished in 1972; building the Stony Lonesome I housing units in 1972; and building Eisenhower Hall, the student activities building, which opened in 1974. The final project in this expansion was the William Lordan Keller Army Hospital, the construction of which broke ground in August 1974, a sixty-five-bed facility designed to provide comprehensive health care to the entire West Point community. It won honorable mention in a Pentagon design competition in 1980.

West Point is proud of its challenging academic program, which the district continues to sustain in the construction of Jefferson Hall, a library and learning center that was scheduled to open in 2008. It will house the Center for Enhanced Performance, the Center for Teaching Excellence, and the cadet library. Jefferson Hall is the first new academic building on campus since Mahan Hall was completed in 1972, and the first new construction to occur on the plain since the nineteenth century. The district incorporated elements of the architectural style of surrounding buildings in the library's design.

The athletic program at West Point includes both physical education classes and competitive athletics. Its rigor contributes to the mental and physical fitness required of an Army officer. Intercollegiate athletics is an important part of the physical program. In 1980 the New York District received bids of more than $20 million to build a 131,000-square-foot structure into the side of a hill that would contain two separate arenas, one for hockey seating 2,800 spectators, and one for basketball seating 5,100. However, although Congress had appropriated the funds in 1980, the Office of Management and Budget did not release the money until 1983. Because the economy had slackened in the interim, a new low bid of $16 million was received and accepted. With separate roofs framed with large steel trusses and sharing a common lobby, locker rooms and offices, the arenas in Holleder Center, named in honor of Major Donald W. Holleder, Class of 1956, who was killed in action in Vietnam in 1967, were finished in time for the fall 1985 sports season.

Thomas Jefferson Hall, a new state-of-the-art library, the first academic building to be erected at West Point in 36 years

The district finished the Kimsey Athletic Center, a four-story football operations building, in the spring of 2003 on a site adjacent to Michie Stadium at a cost of $25 million. Some of the cost was defrayed by a $7-million donation from James V. Kimsey (Class of 1962 and the co-founder of America Online, Inc.), the largest individual gift West Point has ever received. The remainder came from the alumni association.

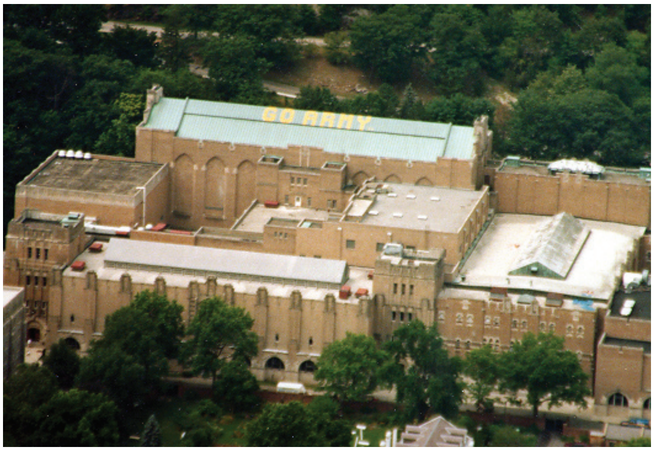
Even more recently, West Point's physical education facilities were further bolstered with the completion of the Arvin Cadet Physical Development Center – the academy's gymnasium. The original building was constructed in 1910. Five additional buildings were attached to the original structure over the next sixty years, resulting

The Kimsey Athletic Center and Michie Stadium, West Point, New York, circa 2005 [U.S. Military Academy at West Point] in floors that were not at the same level, a variety of entrances, mismatched roof lines and several problematic mechanical systems. The district considered renovating this facility in 1990, when the project began. Because the building needed to provide handicapped access, equal space for female cadets, a new electrical system, and most importantly an upgrade of its seismic strength, renovation of the building was deemed too expensive. Instead most of the roughly 250,000 square foot building was demolished and replaced with a new structure some 40 percent larger on the same footprint.

Because the Arvin Gym was worked on by every major architect who worked at West Point in the twentieth century, it is a key element in the historic district. The task force responsible for the design of the new facility, which visited Yale, the Naval and Air Force academies, and the University of Georgia to inspect their facilities, took this historical significance into account. The main entrance and lobby, the oldest part of the original 1910 Hayes Gym, was retained. The new construction also used architectural elements from the Hayes Gym, including limestone or cast stone trim and crenellated roof lines. Lighting fixtures and architectural elements were also salvaged for use in the new building.

The new physical development center is six stories tall and caters comfortably to exercise, training, and competition. Besides the requisite basketball and racquetball courts the facility has three Olympic-size swimming pools, one of which has a wave generator to simulate choppy water. Cadets take swim lessons and must demonstrate they can handle themselves with combat gear in deep water. The center also has boxing facilities, wrestling rooms, a forty-eight-foot climbing wall and a maze where cadets receive training in navigating terrain under difficult circumstances. Arvin, which was built in three stages over five years, cost $97 million and opened in June 2005. The Army projects it will meet West Point's physical education needs for fifty to sixty years.

The military history learned by students at West Point was often made by its own graduates, and it is fitting that the Greek Revival alumni center at West Point, known as Cullum Hall, stands out among the campus's many Gothic Revival buildings. Designed by the noted architect Stanford White in 1898 and a significant element in the National Historic Landmark district, the building's first floor is dominated by the Pershing Room, a formal hall that is used for receptions and ceremonies. The ballroom on the second floor can hold 700 persons and chandeliers from the Thomas A. Edison factory light many of the rooms. Graduates of the academy who have died in battle are memorialized on bronze plaques throughout the top two floors. In 1989 the district supervised a painstaking nine-month-long restoration of Cullum Hall. The 350 coffers in the ballroom ceiling were all hand painted. An aluminum leaf refinishing process was applied to the wood moldings, and the exterior was completely cleaned. In 1991 the district won a Corps of Engineers design award for the project.



The Arvin Cadet Physical Development Center, West Point, New York, circa 2005

Cullum Hall, West Point, New York, circa 1995

In order to attract the best students West Point strives to offer facilities that compete with the elite private universities. In 1990 the district completed an $11-million renovation of Scott Barracks, one of oldest buildings on campus. Scott, which houses 500 cadets, resembles a typical college dormitory. There are generally two or three cadets to a room. Each has a desk equipped with a private telephone line and a fiber optic port.

The expansion of the cadet mess hall was a $27-million project that started in 1995 and ended when the facility went into full operation in the fall of 1998. The mess hall is a 200,000-square-foot building that dates from shortly after the end of World War II. The scale of the kitchen is impressive. Its staff of 300 feeds more than 4,000 cadets; on spaghetti nights the staff prepares a ton of sauce in 400 gallon kettles. The district's challenge was to remodel the kitchen and improve the efficiency of the operation, without missing a served meal. The district inserted a penalty for lost meals in the contract, and the contractor built a temporary facility, which was in place at Christmas of 1995, that served the cadets as construction progressed. In the new facility, the entire student body can eat breakfast or lunch in less than twenty-five minutes.

The New York District supports West Point's pursuit of its mission through the building of other support facilities and campus housing and through infrastructure construction and repair. In the spring of 1988, the commissary, a 73,000-square-foot full-service supermarket was opened to shoppers. A taxing project came the district's way in the late 1980s. After West Point took over the campus of the defunct Lady Cliff College, it designated Olmsted Hall, a former classroom building, to display its vast collection of military artifacts. The project required gutting the building and retrofitting six themed galleries into it: small and large weaponry; West Point history; the history of the United States Army; American military history; and the history of warfare. No "as-built" drawings of Olmsted Hall could be located, and although drawings were prepared

The Mess Hall at West Point, New York, circa 2000 [U.S. Military Academy at West Point]

for the architects and engineers to use as the first step of the project, they could not show everything. Some mid-project discoveries necessitated design modifications.

Assembling the bid documents proved challenging as well, as did evaluating the bidders' submissions, because the project was somewhat amorphous. The contractor not only had to design galleries that appropriately displayed the collection, but also had to make decisions about which of the hundreds of artifacts to exhibit in the galleries. West Point holds what is considered to be the oldest and largest collection of military artifacts in the nation; it is used in cadet academic instruction and for public visitation and research.

Bidders were asked to submit a package that contained details of their background in museum work, drawings of previous projects, sketches of proposed displays for the current project, and various other items, including price. Points were awarded for each category and the district awarded the contract to the bidder with the highest score, who was not necessarily the lowest bidder. The West Point Museum opened in 1989.

Almost a decade after the West Point Museum opened, the 118-unit Stony Lonesome II housing project was finished in October 1998, the first major housing construction at West Point since 1972. An especially notable infrastructure improvement, also completed in the late 1990s, involved the rehabilitation of the Cullum Bridge, a handsome structure with a unique granite façade built in 1969. To correct defects in its structural members caused by the corrosive effect of the salts used to de-ice the roads, temporary closure of the bridge was required. Reconstruction and repair, which began in December 1997, involved replacing the deteriorated structural elements, resurfacing the roadway, repaving some access roads, and replacing the granite façade. This latter task required disassembling the granite carefully, numbering the pieces and putting them back as they were. The $4-million project was completed in May 1999.

In the summer of 2006 the district was anticipating two significant projects at West Point. A major new science center being planned for the old library building was expected to enter the design phase. The other project involved the likely move of the United States Military Academy Preparatory School from Fort Monmouth, which is slated for closure, to its namesake campus.

Despite great changes in American defense forces, the district had a healthy and mostly steady military construction program throughout the entire three decade period covered by this book. The broad forces shaping the

The Stony Lonesome housing complex at West Point, New York, circa 2000

Cullum Bridge, West Point, New York, circa 2000 [U.S. Military Academy at West Point]

military left their imprint on the district's work. Four factors stood out, three of which were military: the end of the Vietnam War in 1975, America's longest military conflict; the gradual winding down of the Cold War between 1989 and 1991; and the launch of the Global War on Terrorism in 2001 in the aftermath of the terrorist attacks on the World Trade Center and the Pentagon, including invasions of Afghanistan and Iraq. In the wake of the Vietnam War the Pentagon ended the draft and adopted an all-volunteer professional army. This led to a heightened emphasis on recruitment and greater attention to the conditions in which American servicemen lived. For the district this meant work refurbishing recruitment stations, and designing and building quality-of-life facilities for military personnel. The end of the Cold War occasioned a reassessment of American military needs and strategies, which in turn led to district work at decommissioned Strategic Air Command bases and the reconfiguration of posts targeted by the Base Realignment and Closure Commission. The Global War on Terrorism caused district personnel to be sent to scenes of conflict in Afghanistan and Iraq, and it hastened Pentagon efforts in confronting lethal enemies other than conventionally fortified armies. Besides these three martial factors, there was another important influence on the district's military construction program: a phenomenon often summarized by the imprecise term "high tech." Over the course of these decades, district personnel worked on advancing the agency's technological sophistication, particularly with respect to digital and other forms of advanced electronic circuitry.

The New York District encompasses an area not generally thought of as containing a large military presence, particularly after the New England states were transferred to the New England District. Yet with Fort Drum (covered in the next chapter) and McGuire Air Force Base, two major weapons development or production facilities, West Point, a handful of smaller posts, and numerous recruitment stations within its military boundaries, the district had a full plate of military projects in the years between the mid-1970s and the middle of the first decade of the twenty-first century.

Sources for Chapter 2:

Formal interviews provided the basis for much of the content in this chapter. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Stuart Piken provided information on the BRAC process. James Demetriou offered an overview of the district's entire military program including the New England bases, the Greenland projects, West Point, Fort Monmouth, and the Picatinny Arsenal. Arthur Connolly and Michael Rovi both discussed West Point, and Connolly added additional information about Fort Monmouth. Beyond the formal interviews, informal conversations with many current and former New York District employees contributed significantly to this chapter. In many cases these individuals shared material from their personal files, which they had collected over many years. Most of the military posts within the district's military boundaries maintain websites that provide historical information. Although project reports and related documentation might have provided a greater level of detail for this chapter, in many instances the author was not able to obtain these from the installations. In addition to the above, the following sources were useful in providing context.

Books:

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Arthur Connolly, Chief, Engineering Division, New York District. Interviewed January 5, 2006, by Howard Green.

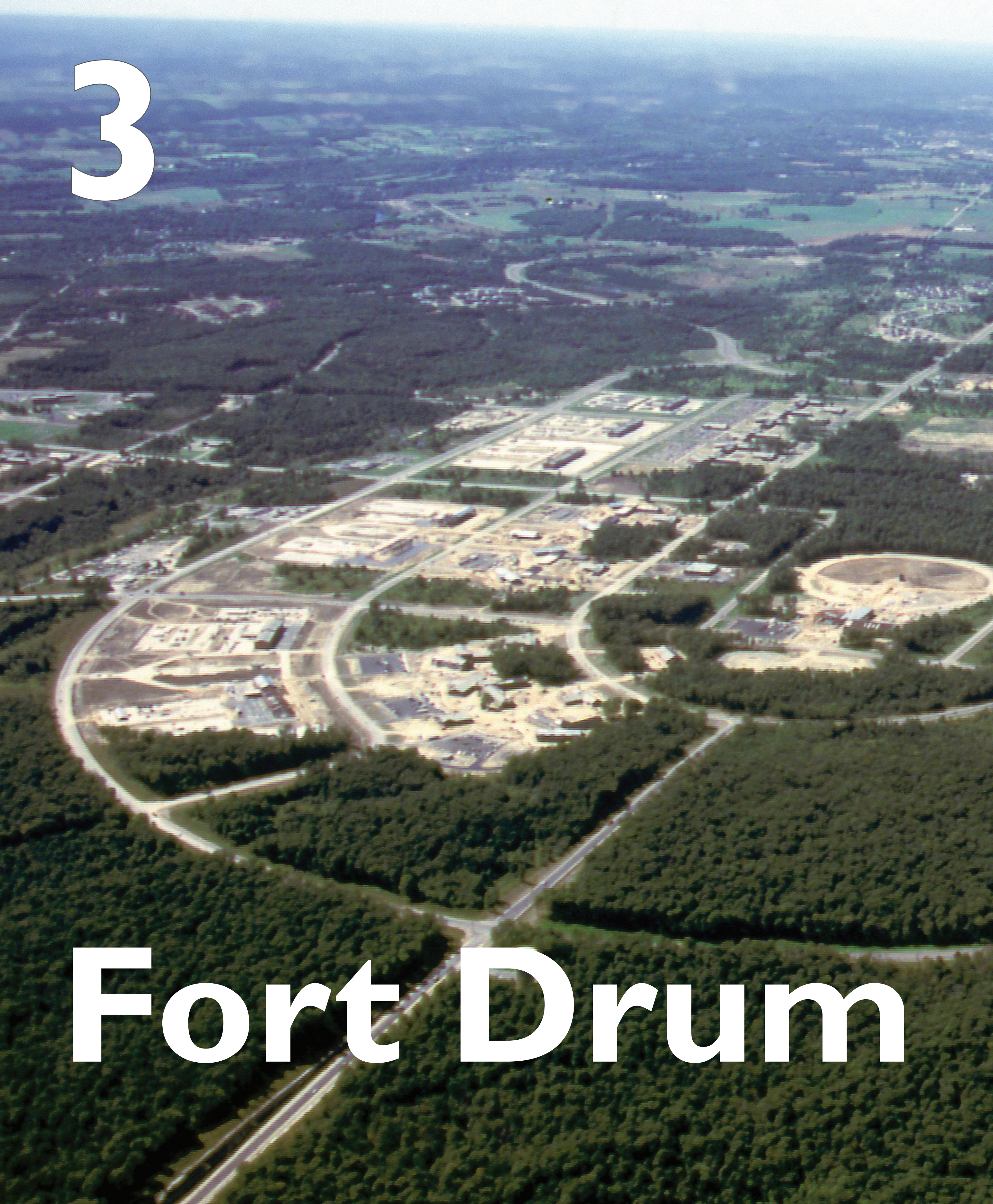
James Demetriou, Project Manager, U.S. Military Academy, West Point. Interviewed December 15, 2005, by John Lonnquest.

Stuart Piken, Deputy District Engineer for Programs and Project Management, New York District. Interviewed November 14, 2005, by Howard Green.

Michael Rovi, Deputy Chief, Engineering Division, New York District. Interviewed December 14, 2005, by John Lonnquest.

3

Fort Drum



In early 1984 the Pentagon announced a new direction for the Army. After years of preparation for war against the heavily mechanized Soviet Army, strategists began thinking about fighting asymmetrical wars against insurgencies or enemies that adopted guerrilla tactics, and other situations that might require speed and mobility. This meant little in the New York District until Fort Drum, an unsung Army Reserve facility near Watertown, New York, roughly one hundred miles north of Syracuse, was chosen to be the home of an infantry division being assembled for this purpose. On short notice the district was tasked with the largest military construction project in its history.

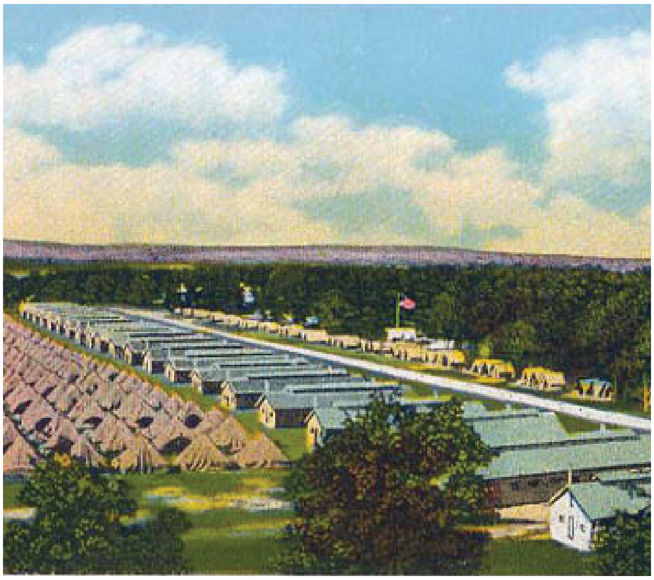
Aerial view of Fort Drum, New York

The Army has run training exercises in the vicinity of Fort Drum for a century, and the military presence in the area goes back another hundred years before that, to the hostilities between Britain and the United States that led up to the War of 1812. To prevent smuggling across the border between New York and Canada, in 1809 an American infantry company was stationed in Sackett's Harbor, a village at the mouth of the Black River at the eastern end of Lake Ontario. During the War of 1812 infantry stationed at Sackett's Harbor twice repelled British attacks.

A century or so later, not long after Brigadier General Frederick D. Grant, son of President Ulysses S. Grant, used the area for troop exercises in 1908, the federal government purchased land for a training ground in Pine Plains, Jefferson County, New York. Located in the western foothills of the Adirondack Mountains, the property became the core of the future Fort Drum. In 1935, following a training maneuver there that involved more than 36,000 soldiers, the War Department purchased additional property. During World War II, Pine Camp, as it was then named, underwent a major expansion. This remote post served as a training base for three divisions: the 4th Armored Division; the 5th Armored Division; and the 45th Infantry Division. It also served as a prisoner of war camp.

In 1951 Pine Camp was renamed Camp Drum, memorializing Lieutenant General Hugh A. Drum who commanded the First Army in the early days of World War II and the New York National Guard. During and after the Korean War the Pentagon used Camp Drum for cold weather training. The post became Fort Drum in 1974 when a permanent garrison, a part of the 76th Engineer Battalion (Combat Heavy), was assigned to it. Eventually most of the battalion called Drum its home until its deactivation in June of 1985.

In January 1984 the Army announced its new strategy. For roughly thirty years it had focused on stopping a Soviet assault by emphasizing divisions that were heavily outfitted with tanks, armored personnel carriers, and other equipment. Now the Army sought a new approach that made greater use of more lightly equipped foot soldiers. This change in strategy was spurred in part by the success of the Israeli invasion of Lebanon in 1982 during which quick-moving, dismounted infantry were deployed to take high ground in the hilly south. The low intensity fight in Grenada in 1983, when U.S. troops toppled a Marxist regime that had recently taken power in a bloody coup, further suggested to the Army that it needed to be able to react quickly against different types of enemies. Increasingly American military strategists were anticipating combat with guerrillas and insurgents, or looking toward multiple minor conflicts in addition to major conventional wars. Seeking speed and mobility, the Army proposed the creation of two light infantry divisions that could be quickly introduced into distant crises around the globe, aiming to contain them before they spread. The proposed divisions – one to be converted from an existing division, the other to be newly formed – would have roughly 10,000 soldiers rather than the 18,000 in heavy infantry divisions; but the light divisions would actually have more total combat forces, sometimes called "foxhole strength," because they would require less support. They would also be able to reach combat zones roughly three times faster.



World War II-view of Pine Camp, a Fort Drum predecessor

In February 1984 the announcement of this new direction was followed with the news that one of the light divisions would be drawn from the 7th Infantry Division stationed at Fort Ord, California, which would continue as its base. The location of the second light division, to be created from scratch, had not been determined, but the *Washington Post* reported that "several congressmen were lobbying to have it located in their respective districts." In April came word that the Army was preparing an environmental impact statement on the stationing of the new light infantry division. The bases under consideration were: forts Greeley, Richardson, and Wainwright in Alaska; Fort Benning, Georgia; Fort Campbell, Kentucky; Fort Drum, New York; Fort Lewis, Washington; and Fort Ord. This was not necessarily an all-or-nothing proposition for any of these posts because the Army was considering the possibility of splitting the division and moving the component parts to separate bases.

When the environmental impact statement was released in May by the Corps of Engineers' Mobile District it identified eight possible arrangements for providing a home for the new 10th Infantry Division, of which six included Fort Drum in some capacity. Fort Drum was ultimately selected to be the new home of the 10th Infantry Division on September 11, 1984. When the big project was announced, the New York District was tasked with managing design and construction of the fort's expansion on a much-accelerated track. The district had a contractor in Utica, New York, already working on a less ambitious long-range plan for the base, and it immediately expanded this firm's charge to include developing a master plan for a 10,000-strong light infantry post at Fort Drum, rather than the much smaller Army Reserve training facility the contractor had been working on. For the next few years, Fort Drum was, according to the Chief of Engineers, Lieutenant General Henry Hatch, "the most important mission" in the Army Corps of Engineers. The program description, which would raise the district's military construction capability to new heights of accomplishment, was this: plan, design, and build a post where 10,400 active duty soldiers could be trained, housed, and fed, and where 8,300 Army reservists could receive intensive training. Including families and support personnel the total year-round population around Fort Drum would grow from 900 in 1984 to more than 27,000 in 1991.

In early 1984, the New York District already had a full workload of military construction projects. West Point was building; installation support at forts Dix and Monmouth had recently escalated to record levels; there were projects under way at McGuire, Loring, and Hanscom air force bases; the arsenals at Picatinny and Watervliet required rehabilitation work; and, after a long hiatus, a construction effort at the Thule Air Base in Greenland was taking shape. Despite the magnitude of the Fort Drum project, these important missions, as treated in the previous chapter, were carried on without interruption.

THE 10TH MOUNTAIN DIVISION

The 10th Infantry, which was renamed the 10th Mountain Division (Light Infantry) when it was officially reactivated in February 1985, is one of four divisions in the 88,000-strong XVIII Airborne Corps. The 10th is the harsh conditions unit of the 18th Airborne. It was first activated in 1943 and saw extensive combat in the campaign to break the Gothic Line, the German army's last stand in northern Italy in 1945. The 10th also served with NATO forces in Germany before it was deactivated in 1958.

The mission of the 10th Mountain Division is to be ready to deploy rapidly anywhere in the world, and to arrive prepared to face severe conditions, fight, and win. It is the most deployed division in the U.S. Army. As of June 2006 the division had its First Brigade in Iraq and its Third Brigade in Afghanistan, a total of 10,494 troops; its Second Brigade was deployed to Iraq later that summer. As of June 2006 the 10th Mountain had lost 45 soldiers in Iraq and 23 in Afghanistan.

It was not only the scale that made the Fort Drum project such a challenge. There were three other complicating factors as well: timing, location, and concept. With regard to timing, the Army wanted the 10th Mountain Division completely activated in 1990, and the entire project completed in 1991. The Pentagon wanted the mobilization of the new division well under way before the end of President Ronald Reagan's second term, in January 1989. This may have been because the light infantry idea had its critics both inside and outside the Pentagon. Some military planners argued that light divisions duplicated the Marines. Others wondered if the light division would not just get heavier over time, negating the whole idea. For whatever reason, the schedule was, as deputy district engineer Lieutenant Colonel W.L. Hernson described it, "unmercifully compressed."

Insofar as its location was concerned, there were three reasons the Army picked Fort Drum. It was one of the largest (roughly 107,000 acres) and least used tracts of land the Army owned. The post's uninviting climate – long, severe winters generally produce in the range of twelve feet of snow (sometimes eight feet before Christmas) and drifts that can reach twenty feet – suited the Army's desire for a rough-terrain training ground. Lastly, Fort Drum was situated in an economically depressed region. Unemployment in Jefferson County, where Fort Drum is located, peaked at 20 percent in January 1984 and averaged 13.5 percent in the first half of the year, more than double the statewide average. While these considerations met the Army's overall locational needs, the latter two in particular made building the new post challenging. Not only were there mountains of snow and ice to contend with, the frost line was generally four to five feet deep and the building season in a bad year could be as brief as from mid-April to early December. Furthermore, while the depressed local economy may have made some labor available, the region did not have a large supply of suitably qualified subcontractors.

The last of the three complicating factors – the overall concept behind the new Fort Drum – was perhaps the most challenging of all. No one knew precisely what a light infantry division was or what a post for it needed to provide. There was no template to work from. The district and its contractors were designing a large facility for a function the Army was still defining, and the Army gave them less than two years to do it – two years to conceptualize, plan, and design a base for a flexible strike force whose job was to muster and deploy effectively on short notice.

The first task was to assess the fort's existing buildings, most of which dated from the World War II period. How much could be rehabilitated and how much would need to be newly built? The job of figuring out the answer to this question went to the Utica contractor working on the master plan. The district gave the project team twelve days to complete the work. Most of the existing buildings in what was called the old Pine Plains section of the post were left for the National Guard and Army Reserve soldiers who would continue training at the fort every summer, but some were renovated to accommodate a battalion from Fort Benning, Georgia, which moved up to Fort Drum. The site plan the project architects ultimately came up with was so different from the older post that it became the recipient of a new name: Mountain View. The plan was generally drawn to minimize the impact of the high winds and heavy snow that winter brings to the Fort Drum vicinity. The entire post was laid out in an east-west orientation. Its long roads ran parallel with the prevailing northwesterly winds so they would scour the roads rather than blow snow across them. Trees were planted to act as wind and snowdrift barriers. Entrances and roof lines of buildings were designed on angles that lessened the ferocious impact of wind and snow.

The second task was setting up an effective management structure for the construction work. The district created two new offices to manage the project, one in New York City and one on site. The New York management office for Fort Drum at district headquarters was known as the Fort Drum Design Branch (Rear) and took overall charge of the design effort. Its main purpose was to turn the needs of the 10th Infantry into buildable designs. Project teams within the Design Branch would work in concert with the contractors and the client.

Planning this structure was easier than staffing it. The economy of New York City had recovered from the nadir it reached in the mid- to late 1970s and was expanding. Young engineers were relatively easy to hire because the project offered interesting challenges and a higher-than-usual level of responsibility, but more senior engineers with the level of experience required for leading this work were in short supply. By establishing a routine nine-hour workday, which meant an additional 12.5 percent of the pay at overtime rates, the district was able to draw selected engineers from various branches and divisions and move them to the Fort Drum project. (The Fort Drum Design Branch ultimately took on 10 percent of the district's design branch personnel.) This in-house staff was augmented by a few outside hires. By keeping the amount of outside hiring to a minimum, the district aimed to build a close-knit and productive project team with limited turnover of staff.

At Fort Drum the district created an on-site construction management unit, whose job was to turn the designs into actual buildings. A total of 165 positions were authorized for the Fort Drum office, twenty-three of them military. To meet the need for speed the Fort Drum office was given more than the usual amount of authority for an area office. Under the leadership of deputy district engineer, and chief of the Fort Drum Construction Management Office, Lieutenant Colonel Ralph M. "Dan" Danielson (who later became New York district engineer), it assumed responsibilities and authority normally associated with a district. For example, resident engineers could authorize change orders up to $50,000, and the area engineer up to $100,000; in late 1988 the deputy district engineer received authority to approve changes up to a value of $5,000,000 (a level of authority usually reserved for a district contracting officer).

In February 1985 the district had a design team in place. Contracts went at first to eight architectural/engineering firms, though the total eventually grew to twelve, each of which had distinct design responsibilities, such as roads and infrastructure, headquarters, hangars, warehouses, and land use. Involving so many different firms drew some criticism from the Army senior leadership. The Vice Chief of Staff wanted to be sure the post had a cohesive design, and the Commanding General of Forces Command wanted assurances the finished post would be a model installation. The district responded that there was no single architectural/engineering firm that could match the Corps of Engineers for experience in designing a complete installation; its Fort Drum Design Branch would be the unifying agent.

To assist in finding a unifying architectural theme, the district established a design guidance board, whose job, difficult under any circumstances, was further complicated because the design contractors were already at work. The board, comprising representatives of each contractor, the Assistant Division Commander of the 10th Mountain Division, and district staff, presented three alternatives to the Commander of the 10th Mountain and to Forces Command: a regional historical concept, reflecting the architectural flavor of Sackett's Harbor and Watertown; a high-tech, or futuristic concept with an abundance of chrome and glass, suggesting the forward-looking mission of the 10th Mountain; and an "early Fort Bragg" theme, which implied building as cheaply as possible and downplaying "architectural nuances."

The board's recommendation of a compromise between the first and third approaches carried the day up and down the decision-making hierarchy. References to local architectural tradition through roof lines, fenestration, building materials, and other means would be more prominent at the center of the post and less so on buildings toward the periphery, which would be more utilitarian in design. Brigadier General Paul Cerjan, Assistant Commander of the 10th Mountain Division, who had experience with the Corps of Engineers and in military construction, was appointed to supervise this effort. His job had three parts. First, he had to ensure that designs submitted by the contractors complied with the basic concept. Second, he needed to keep the plans moving swiftly through the approval process. The third part of his job, however, was perhaps the most critical to timely completion of the project: General Cerjan was responsible for seeing that the Army conveyed its criteria for the base to the district and its contract designers as early as possible in the process so that late changes in design could kept to a minimum; the later in the design process a change occurs the greater the delay and cost increase it causes.

As engineering and design work raced ahead, with as many as 800 to 1,000 people involved at its peak, the district turned its attention to how to get the job built. The first thought was to do it as they would any big job: issue contracts for sequential portions of the infrastructure and facilities until the job was done. But the district quickly realized it could not meet the Army's timetable this way. Instead it started on three pieces immediately and simultaneously – basic infrastructure, family housing, and some community facilities – even while design of later elements was still under way. It also started planning for a massive multiyear contract that would include the majority of the construction that the new cantonment would require.

It is hard to convey the magnitude, speed of construction, and overall achievement of the Fort Drum project without resorting to some numbers. The $66.9-million infrastructure contract signed in May of 1986 included thirty-five miles of highways, ten miles of gas pipelines, seventy-two miles of water lines, and forty-nine miles of sanitary sewers, among other features. Its award to the Morrison-Knudsen Company, doing business as Fort Drum Constructors, began a remarkable transformation of Fort Drum and the entire Watertown area. The contract was completed in fall 1988 at a final cost of $72 million, the increase resulting mostly from contract options exercised by the Corps.

In order to bring troops to the base, places for them to live were necessary. The availability of housing thus became the key "pacing factor" for activation of the 10th Mountain Division, and finding a way to supply it as quickly as possible was an urgent need. The first effort centered on the award of a $50-million contract for on-base housing to a Morrison-Knudsen Company subsidiary, but this ran into trouble due to bidding errors and other problems. This led to a delay of a number of months and this residential component was one of the very few pieces of the overall project that was not completed on schedule.

Attention soon focused on the private sector as a partial solution to meeting the accelerated schedule imposed on the Fort Drum project. The push to privatize various government functions came generally from the Reagan administration, which looked at contracting out many government services ranging from railroad operations to the post office. Secretary of Defense Caspar W. Weinberger proposed privatizing the whole Fort Drum project in the summer of 1985. The idea was to borrow $400 million from large investment and construction companies at below market rates, and pay it off over twenty-four years. Some derided the idea as "rent a post," and it was abandoned for a number of reasons, chief among them a concern over statutory limitations on the Army's ability to enter into long-term contracts.

Privatizing the whole Fort Drum construction project may not have been feasible, but 1,950 units of off-post housing for Fort Drum were built by private-sector developers. Section 801 of the Military Construction Act of 1984 permitted the armed services to privatize construction of off-post housing for military personnel, and Fort Drum represented the first large-scale implementation of this innovation. The act permitted the armed services to enter into long-term lease agreements with private developers to build housing that met Army specifications and local building codes. Under Section 801 the developer is responsible for the entire endeavor, including financing, land acquisition, permits, and approvals. The developer also maintains the property once it is built. In return, the Army guarantees that it will lease the housing for twenty years, after which it has a first option to purchase the property at market price. The first twenty-four units of Section 801 housing opened in Clayton, New York, near the post, in September 1986. Altogether, 1,950 units were built by four developers in thirteen communities within a thirty-mile radius of the post. Not long after the housing was occupied, some of the families renting the homes farthest from the base commented that they were a little too far away since so many family services were provided at the post rather than in the towns where the housing was located.

The post's central heating plant and some smaller pieces of the Fort Drum project were privatized as well. J.A. Jones Construction from Charlotte, North Carolina, doing business as the Black River Limited Partnership, received a contract worth approximately $93 million to build, own, and operate a central heating plant for Fort Drum. According to the terms of the contract, the Army committed to buy heat for the fort from Black River for twenty-five years, after which it had the option to buy the plant at its fair market value. The plant's full name was the High Temperature Water Service Cogeneration Plant ("cogeneration" refers to a plant that generates both heat and electricity), but the district christened it COCO, for "contractor owned and contractor operated." COCO took water from the Black River and converted it in three massive boilers to steam, some of which it sent to a turbine that generated 49.9 megawatts of electricity, which was sold to the local power company. The rest of the output, in the form of hot water, was pumped through twenty-seven miles of pipe to heat the new buildings at Fort Drum. COCO's boilers were fueled 90 percent by a combination of anthracite (hard) and bituminous (soft) coal and 10 percent by locally produced wood chips. The wood chips component of the fuel source was a special concern of Congressman David O'B. Martin, a former Marine captain who represented the area and was widely acknowledged as the leader of the effort to bring the 10th Mountain Division to Fort Drum. Due to its high cost the contractor was later terminated for the convenience of the government and individual boilers were installed in the facilities. There were three other

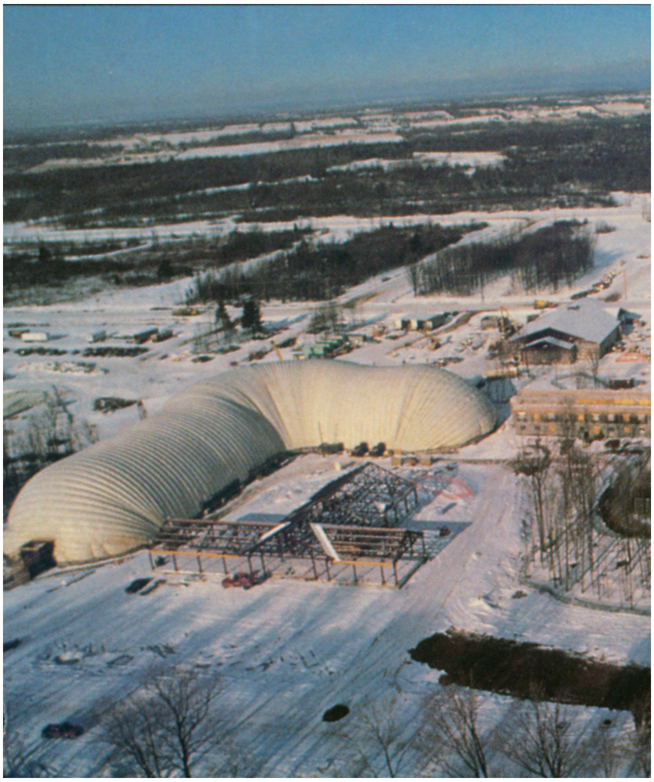
Site preparation in progress at Fort Drum in the late 1980s smaller privatization initiatives at Fort Drum: a $3-million transient lodging facility; a $2-million bank; and a Burger King franchise. The total value of work done at Fort Drum under the privatization program came to nearly $350 million: more than 25 percent of the overall Fort Drum expansion budget.

The need for speed led to other funding innovations beside privatization. One was regionalization. For example, instead of building its own sewage treatment plant or water supply, the Army worked with New York State to use facilities built by the Development Authority of the North Country to serve the whole region. Still more significant than the regional approach was the multiyear appropriation. The typical military construction project is funded annually by Congress in the military appropriation budget, but Congress gave Fort Drum a three-year appropriation for $610 million, which came to be called FY87+ (fiscal year 1987 plus). Because the $610-million figure was arrived at by Congress when the design documents were only 35 to 40 percent complete, it only reinforced the need for speed in project implementation. But $610 million ultimately proved to be insufficient funding for the job as first designed.

In November 1986 the New York District received offers from four consortia of leading construction firms in the country on a bid package that included roughly 8,900 drawings. These were all far above the Congressional appropriation cost target. The district Engineer at the time, Colonel F.H. “Bud” Griffis, maintained that the district knew the project would cost $700 million to $750 million, but the Pentagon, overestimating the amount of money that would be saved by economies of scale on the massive undertaking, calculated that $610 million was the right amount. Sensing potential problems, the district repeatedly asked for and received assurances that it had designed the project to proper scope. When the initial offers came in too high, the district reduced the project somewhat, issued 4,000 new drawings based partly on value engineering savings, and amended the request for proposals. When the second round offers, which reached the district in January 1987, were still too high, the district met with each of the bidders, clarified various project details and asked for their “best and final” offers. In March these “best and final” offers still came in too high. One of the four bidders complained that it had already spent $1 million on the process. The *Engineering News-Record* editorialized that the Corps “seems to be asking for miracles.” Finally after further discussions with the proposing groups, the package was reduced to an awardable size by allowing for some less expensive construction methods and cutting out various items, thereby saving approximately $160 million worth of work. The eliminated pieces included an airfield complex and some other important elements, which then had to vie for funds in post-1989 annual military budgets, but a successful offeror was at last chosen to undertake the largest single Army construction project since World War II.

The contract, which referenced 5,370 drawings, went to Black River Constructors, a joint venture that included the lead firm Morrison-Knudsen Company, Martin K. Eby Construction Company, and Huber, Hunt & Nichols. Many observers of the construction industry were skeptical that they could build the project profitably, because the $610 million authorized by Congress also had to cover $50 million in small business set-asides, $20 million in Corps supervision and administration, and a 2 percent reserve for contract modifications. The Black River Constructors' $517-million contract, the single largest construction contract ever for a troop complex, covered most of the major facilities at the new post: eighty large buildings and sixty-five smaller ones, including barracks, training, maintenance, recreational, medical, religious, and other support structures for six brigade-size units. Also included were expansion of a number of the infrastructure components built under the earlier contract, as well as twenty-nine barracks, seventeen battalion headquarters, ten vehicle maintenance shops, seven dining facilities, five brigade headquarters, a physical fitness center, a dental clinic, a number of health-care facilities, and numerous other buildings.

To a remarkable degree, despite its pace, things went smoothly on this massive job, which was described as "a fast moving train," but there were a few hiccups at the beginning. Black River Constructors rented a number of L-shaped, air-supported fabric domes to use as temporary structures over the construction sites to enable it to work through the winter. When the seams blew out at the elbows, two months were lost. Basically, though, the weather cooperated by being unusually mild and dry, and by the winter of 1988 nearly 545,000 square feet in fourteen buildings were enclosed. During the summer of 1988, construction reached its peak. Contractors had 3,200 workers in the field and there was approximately $1 million worth of work in progress each day. In November 1988 enough of the base was ready that the 2nd Brigade could move in. At the turnover ceremony, Congressman Martin used a bayonet rather than scissors to cut the ribbon. In January 1990 another ceremony was held when the last brick was laid in place meaning that all eighty buildings were enclosed and the work was in its final phase. The contract was completed in October. "This place sprouted like a mushroom," remarked a soldier at the base.



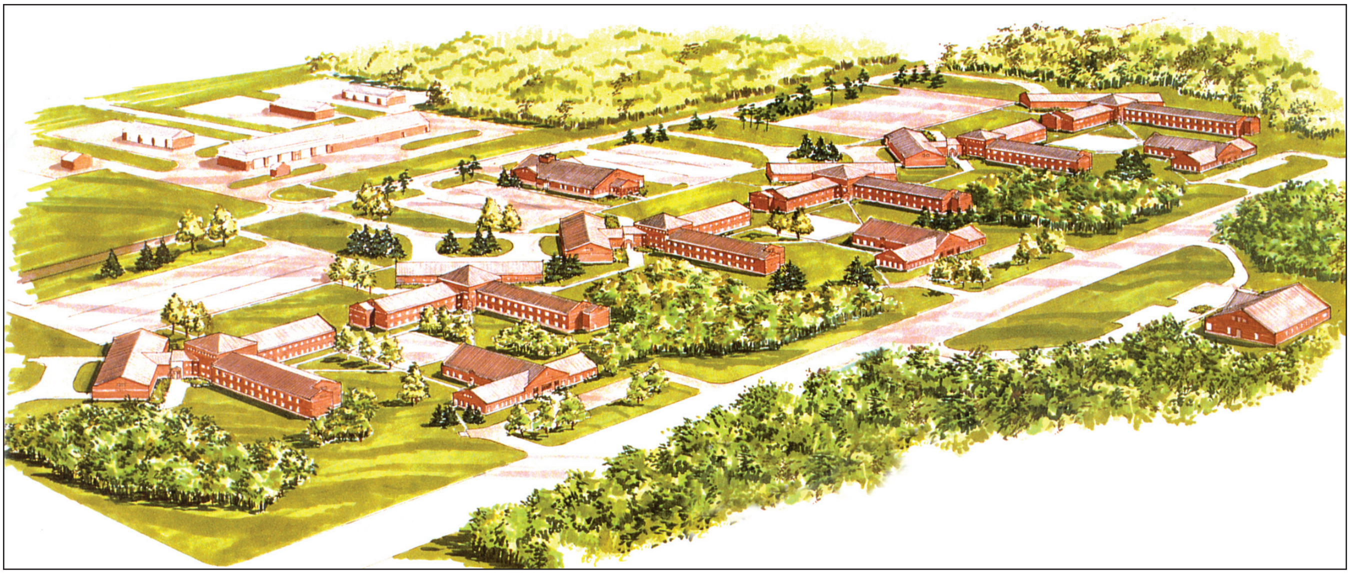
A segmented fabric dome in use for winter construction at Fort Drum, New York, circa 1988

Fort Drum, New York, under construction, circa 1988

THE MAGNITUDE OF THE FORT DRUM PROJECT

Possibly the largest masonry job in U.S. history, the Fort Drum expansion project used 5,942,213 bricks, enough to build an eight-foot-high wall for twenty-two miles; and more than 5 million masonry blocks, enough to extend the wall another eighty-four miles. Contractors excavated 6 million cubic yards of soil and rock, and laid down 304 tons of asphalt and 116,000 cubic yards of concrete. All told, 43 million square feet of floor space was constructed. The landscaping entailed the planting of 43,000 trees and shrubs, including 3,700 evergreen trees, more than 2,800 deciduous trees, and more than 20,000 juniper bushes.

Between 1986 and 1992, the New York District supervised construction of 130 buildings, thirty-five miles of roads, and 4,272 sets of family housing units at Fort Drum at a total project cost of approximately $1.3 billion. For this sum the Army created a sprawling complex of wide curving streets that reminded some observers of a college campus more than an Army post. Red brick and stone buildings reflect the style of barracks built in the early nineteenth century, although the beams are concrete rather than wood. Other architectural features reflect the modern Army. Musket-grey metal roofs provide a contemporary, practical look. Battalion headquarters buildings feature lobbies with high ceilings and skylights. Some main entrances are framed



A rendering of the battalion and brigade layout at Fort Drum, New York

with glass from ground to roof; others feature large semi-circular windows. Barracks are clustered in L-shaped sets adjacent to battalion formation areas, which sit on landscaped knolls. Three battalion settings align to form a brigade area. Inside the barracks, pairs of soldiers typically share a living space that resembles a college dormitory room with an entrance area that has built-in wardrobes, a sink, and a mirror. Each room also has phone and cable television jacks. Two rooms share a two-shower bathroom. On the opposite side of the barracks are large parking lots with access both to the barracks and to the company headquarters. Walkways are covered for winter protection.

In addition to troop facilities and barracks, the base includes the services that soldiers and their families need. A 160,000-square-foot shopping complex includes the post exchange, commissary, clothing store, a garden center, and other shops. The base was so successful that re-enlistments enabling soldiers to extend their stay at Fort Drum ran above 90 percent in its first few years, far ahead of usual rates.

Interior of the commissary at Fort Drum, New York, circa 1995

The new base stimulated economic growth in a region that had not seen any for decades. Besides the 4,000 new houses and apartments built on and off base by the Army, another 6,000 were built by private developers. Farms became housing tracts overnight. Per capita income spurted 30 percent in a short period and the local paper added a Sunday edition. But the growth brought problems for some. The average rent on a two-bedroom apartment increased by more than 80 percent within a few years, and Jefferson County was soon dealing with a homeless population it had never encountered before. A few years later the County was complaining that Section 801 housing deprived counties of utility tax revenues because the Army paid the gas and electricity bills directly, without tax, rather than a private sector taxpayer.

Minor complaints should not obscure the enormous triumph that Fort Drum represented for the New York District's contracting capability. A large measure of the credit for the timely completion of this massive project belongs to the skilled manner in which contracts were let and administered. There were, of course, outstanding contract disagreements at the end of construction and these were settled through an alternative dispute resolution process. The Corps of Engineers was generally trying to settle contract disputes in the 1980s without resorting to the courts, and the agency had already successfully adopted an alternative dispute resolution procedure with Morrison-Knudsen on another matter. (The two parties had settled a $44.6 million claim over the Tennessee-Tombigbee project for $17.25 million.) The Fort Drum project, however, represented by far the largest set of claims that the Corps of Engineers had ever attempted to resolve through a non-litigious process.

Unsurprisingly, some tension had grown between the New York District and Black River Constructors by the end of the FY87+ construction. All the normal disputes that come up in a construction project – differing interpretations of shop drawings, contractual provisions, or professional standards; unexpected site conditions; assessments of the adequacy of work performed; responsibility for costs associated with delays – arose at Fort Drum. Ordinarily such issues are resolved as they occur. But in this case, to save time, when a dispute could not be resolved quickly, it was set aside until the project was complete. Black River was unhappy with this "fix and file" approach because facts become stale over time and the firm worried that key personnel would not be available when the dispute was eventually addressed. The district felt that Black River was exploiting the situation by filing unwarranted claims. At the end of the project 123 claims totaling $44 million remained unresolved.

Black River Constructors also submitted a claim for $83 million for delay and impact damages just as the final dispute resolution process was getting under way. An impartial chairman and a technical expert from each side were appointed to a disputes review panel that heard presentations of the claims one at a time. The panel issued non-binding written recommendations on the merits (but not the dollar value) of each claim, which provided a basis for Black River and the Corps of Engineers to negotiate directly with one another. In August 1991, less than a year after work under the massive contract was completed, the disputes that went before the panel were settled for $41 million, including resolution of the Black River damages claim for $15.25 million. It is impossible to estimate the amount of time and money that was saved by this process, but both sides heralded the outcome.

The last piece of the Fort Drum expansion was the airport. Fort Drum was essentially complete in the summer of 1990, but its Combat Aviation Brigade was still at Griffis Air Force Base near Rome, New York, eighty-five miles away. This impeded the 10th Division's ability to meet its mandate to deploy within ninety-six hours of notification because of the time involved in getting the troops to Griffis. Separately funded, a multiphase project to build a world-class facility at Wheeler-Sack Army Airfield began with a $59-million first phase. The project included extending the runway by 5,000 feet, essentially doubling its length, and building a parallel taxiway along the length. It also included four new hangars for 133 helicopters, a flight operations building, a control tower, a thirty-four-acre concrete parking apron, a rapid deployment facility for staging troops, and a building for preparing and storing pallets before they are loaded onto aircraft. This phase was finished in August of 1992.

Later phases of the Wheeler-Sack Army Airfield improvement included: construction of a $31-million vehicle maintenance facility with eighty-eight work bays and five administration areas; a $90-million brigade-size barracks complex; and interim facilities for the aviation brigade of 1,000-plus members. This latter $76-million project included twenty-five barracks, two battalion headquarters, a brigade headquarters, a dining facility, and several other buildings.

The airfield at Fort Drum, New York, under construction, circa 1991

The completion of the initial expansion did not mean the end of progress at Fort Drum. In the mid-1990s the district built five tank training ranges at a cost of roughly $25 million. These ranges are used for training exercises in tank and machine gun firing, urban assault, and small arms warfare. In 1996 the district built a $6.5-million extension to the non-commissioned officers club that included a banquet room, office space, and an institutional kitchen.

The installation's continued growth to meet the needs of the Army in the twenty-first century resulted in a steady flow of projects for the New York District. Since the start of the new millennium the district has built several new facilities on the main post. The Inclement Weather Weapons Training Facility was an approximately $4-million facility that included firing lanes with computer-operated targetry, classrooms, an arms vault and a weapon-cleaning room. A new multipurpose auditorium included two 425-seat theaters with state-of-the-art sound systems. The two theaters are separated by movable partitions so an entire battalion task force can be briefed in the combined space. A $20-million family support center, housing 600 employees in its 125,000 square feet, was built to consolidate functions under one roof that were formerly spread among many buildings. The Battle Simulation Center completed in March 2004, and currently supporting military actions, replaced an undersized, outmoded complex formerly located in eight separate buildings. The 21,500-square-foot Tactical Unmanned Aerial Vehicle facility allows two platoons to train personnel, and maintain and store their vehicles. Additionally, in four separate projects, the district built seven new barracks and expanded an eighth, adding more than 1,000 rooms, at a combined cost of over $85 million. The district also built an aerial gunnery range for the use of Army rotary-wing and Air National Guard fixed-wing aircraft, and by upgrading an existing thirteen-mile-long single-lane trail to a two-lane roadway training area capable of supporting military convoys, it allowed use of an additional 8,000 acres of land in the eastern portion of the installation for training.

Brigade barracks at Fort Drum, New York, circa 2002 [Fort Drum]

THE NATIONAL GUARD AT FORT DRUM

Fort Drum is also a major training center for reserve component forces. Its ranges, training areas and facilities are essential to the nearly 12,000-member New York Army National Guard's ability to meet readiness objectives and federal training requirements. Units of the New York Army National Guard come to Fort Drum for weekend Inactive Duty Training and Annual Training. The New York Army National Guard also maintains the bulk of its deployable vehicles and equipment at its Mobilization and Training Equipment Site at Fort Drum.

After September 11, 2001 the United States Army began a review that led to its most important reorganization since World War II. As a result of this transformation, the Army has adopted a fundamental shift in its organizational structure and doctrine. Self-sufficient brigade combat teams (BCTs) led by commanders with increased levels of authority will become the basic deployable unit of maneuver. Previously a division was the basic functional unit, holding the assets necessary to wage war that include not only combat power, but the logistical support and specialty units such as communications, engineers, intelligence, and police. Now all this will be based in BCTs consisting of two infantry battalions, one cavalry squadron, one artillery battalion, one support battalion, and a battalion of specialists. Formerly a brigade was approximately 1,800 soldiers; BCTs will include roughly 3,400 soldiers.

The result of this structural reorganization will keep the district busy well into the twenty-first century. As a result of the transformation, Fort Drum will have an additional 6,000, or more, active troops. But the impact goes beyond the increase in troops, family members, support staff, and civilian employees on the base. The base also needs considerable reconfiguration to support the three and possibly four BCTs slated for Fort Drum, and the district anticipates approximately $1.8 billion of construction will be needed between 2013 and 2016 to build barracks, company operating facilities, battalion and brigade headquarters, vehicle maintenance facilities, motor pool areas and dining facilities for the new units. Infrastructure, community and medical facilities, range, airfield and readiness facilities will all require upgrades as well.

LOGISTICS AND SUPPORT AT FORT DRUM

The Fort Drum facility maintains a wide array of services in support of its many permanent and temporary residents. Among the entities and operations based there are:

- American Red Cross
- U.S. Army Materiel Command
- 20th ASOS (Air Force)
- Air Force Weather
- Fort Drum Criminal Investigation Command
- Commissary
- Non-commissioned Officers Academy
- Naval Reserve Center - Fort Drum
- 2d Brigade 78th Division TS
- 7th Legal Support Organization
- 725th Ordnance Company
- 27th Public Affairs Detachment
- 174th Fighter Wing Air-Ground Gunnery Range
- 1215th US Army Reserve Garrison Support Unit
- Medical Department Activity
- Dental Activity
- E/1-58 Aviation Regiment
- U.S. Air Ambulance Detachment

Sources for Chapter 3:

The district's Public Affairs Office maintains two sizable files of material on the Fort Drum project. These files contain contract fact sheets, colonel's briefing summaries, notes on various presentations, information papers from the construction management office at Fort Drum, unpublished reports, newspaper clippings and other items. Much of the information for this chapter came from material in this file. Although project reports and related documentation might have provided a greater level of detail for this chapter, in many instances the author was not able to obtain these from the installations.

These were augmented by oral history. A formal interview with Michael Rovi provided a very detailed picture of the district's work at Fort Drum. The interview with Colonel F.H. "Bud" Griffis offered an overview of the project. Arthur Connolly and James Demetriou discussed some particular aspects of the construction, while Samuel Tosi and Louis Pinata considered some of the large challenges the project posed for the district. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. The Corps of Engineers Office of History at Alexandria has a large collection of interview transcripts about the Fort Drum project. The interview with Anthony Leketa complemented that of Michael Rovi in offering a detailed picture of what was involved in building Fort Drum. Informal, untranscribed conversations with a handful of present and former New York District employees were informative as well.

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"A Template for Light Infantry," *Engineering News-Record*, 24 March 1987, pp. 28-31.

Wilson, George C. "Army to Seek Mortgage to Construct New York Base," *Washington Post*, 12 July 1985.

Interviews:

Arthur Connolly, Chief, Engineering Division, New York District. Interviewed January 5, 2006, by Howard Green.

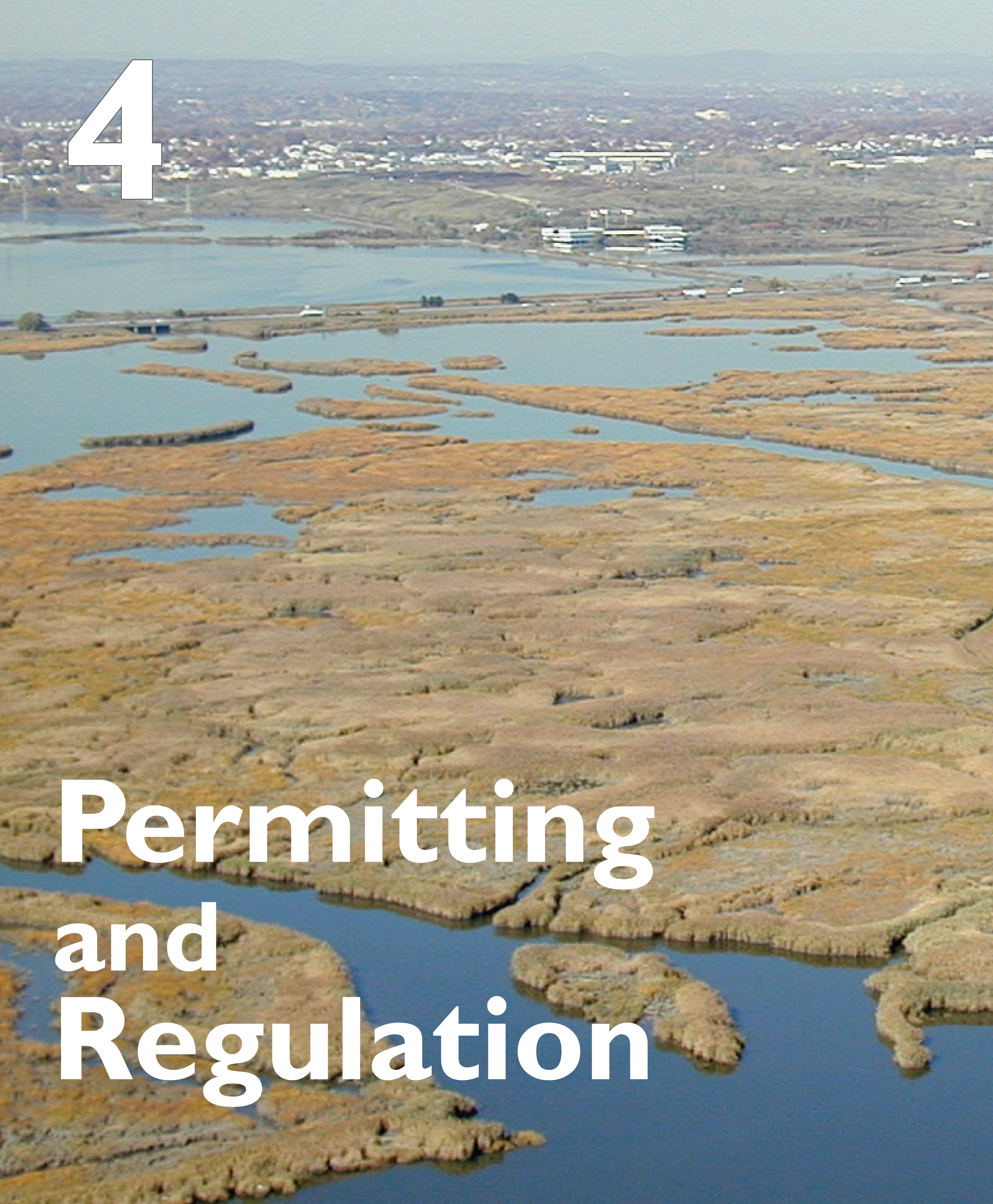
James Demetriou, Project Manager, U.S. Military Academy, West Point. Interviewed December 15, 2005, by John Lonnquest.

Anthony Leketa, Fort Drum Area Engineer. Interviewed March 24, 1993, by Donita Moorhus.

Michael Rovi, Deputy Chief, Engineering Division, New York District. Interviewed December 14, 2005, by John Lonnquest.

Samuel Tosi, Chief, Planning Division, New York District (retired) and Louis Pinata, Chief, Construction Division, New York District (retired). Interviewed December 2, 2005, by Howard Green, Chris Ricciardi, and Carissa Scarpa.

4 Permitting and Regulation



Of the many aspects of the U.S. Army Corps of Engineers mission influenced by the era of environmentalism that dawned in the late 1960s, none was more affected than that of permitting. The Army Corps has been bringing order to actions in navigable waters since 1899. Beginning in the 1930s the Corps's regulatory role gradually expanded. The combined effects of the Clean Water and Ocean Dumping acts of 1972, however, opened up a whole new thrust for the regulatory arm of the New York District. While the majority of permit requests over the years have been straightforward, the comparatively few that were controversial took a lot of staff time and brought the district into some disputes where the sides would not compromise.

Aerial view of the Hackensack Meadowlands, Bergen County, New Jersey

The Rivers and Harbors Act of 1899 empowered the Corps of Engineers to regulate all work over, under, or in navigable waters, and for the following thirty years when applicants requested permits for construction projects in waterways, the agency had primarily one question to answer. Would the proposed work impede navigation? Corps of Engineers policy grew gradually to include considerations beyond this ostensibly straightforward question. In 1933 the Supreme Court broadened the agency's purview by ratifying a district's denial of a construction permit on aesthetic grounds. Thirty years later, revisions to official Corps of Engineers regulations added adverse fish and wildlife consequences as a basis for rejection of a permit, so long as the decision rested "primarily upon the effect of the proposed work on navigation." New considerations entered the review sphere of Corps of Engineers permitting in 1967 when revised regulations were issued directing that decisions be based on "the effects of permitted activities on the public interest, including effects upon water quality, recreation, fish and wildlife, pollution, our natural resources, as well as the effects on navigation." This opened up district permitting branches around the country to grappling with what was meant by the "public interest," and in many ways this is now the basic question the New York District asks every time it considers an application.

In the early 1970s the New York District processed permits from applicants who were planning to build structures along the waterfront, to fill in waters to make dry land on which to build, and to dispose of dredged material at the customary offshore location known as the Mud Dump Site. District boats patrolled the harbor to assure compliance with the relevant laws and regulations. The series of new environmental laws enacted between 1969 and 1980 greatly expanded the purview of the district's regulatory function in two areas: with respect to the disposal of dredged material and to wetlands. Prior to the passage of the Marine Protection, Research and Sanctuaries Act (Ocean Dumping Act) of 1972 the Corps of Engineers routinely issued permits for ocean disposal provided that the discarded material would not be dumped in such a way that it might form a mound that could obstruct a navigation channel. No one regulated what was unloaded in the seas on environmental grounds. After the Ocean Dumping Act became law the district was required to assess the environmental impact of every ocean dumping project within its boundaries. Because the controversy over the disposal of dredged materials involved the district's own projects as much as those of applicants for its permits, and emerged as such a complex and widely debated issue, it is treated separately in Chapter 6.

Wetlands regulation hit the district a little later in the 1970s. Section 404 of the amended Federal Water Pollution Control Act (Clean Water Act) of 1972 gave the Corps of Engineers responsibility for overseeing discharge of dredged or fill material into the navigable waters of the United States. When someone wanted to dredge, fill, or build in, or near, navigable water they were required to apply to the Corps of Engineers for a permit, and the agency was required to review the application by the same measure used in assessing its own federal undertakings under the National Environmental Policy Act (NEPA) of 1969. Corps of Engineers reviewers were instructed to look at a proposed action's impact on navigation, wildlife, fish, pollution, aesthetics, ecology, and the general public interest. Input from the Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, interested state agencies, private groups such as environmental organizations, and individual citizens all had to be considered.

Nationally, the Corps of Engineers at first seemed more to have perpetuated its close relationship with the construction industry, as opposed to upholding wetlands protection, and initially, the New York District, like the Corps nationally, wrestled awkwardly with making environmentally related decisions that seemed to limit economic growth. Congress, in 1977, amended the Clean Water Act again, this time explicitly replacing the previous term "navigable waters" with "waters of the United States," further expanding the area of oversight to include "adjacent" and "isolated" wetlands. Gradually, the Corps began to adjust more effectively to its new management role balancing the protection of both waterways and wetlands with its more accustomed posture as an enabler of construction.

In 2005 the New York District processed roughly 1,700 permits. In some years the district has seen as many as 2,000 applications, the vast majority of which involve small and straightforward requests: a boat club wanting to repair its floating pier; Westchester County wanting to repair a bridge in Mamaroneck; Amerada Hess Corporation wanting to dispose of the material it dredged from a wharf in the Kill van Kull; an individual property owner wanting to repair a dock; and so forth. The more controversial cases like Westway, which played out in the 1970s and early 1980s, overshadow the typical permitting actions, but they shed valuable light on the new regulatory milieu.

WESTWAY

It would be hard to find a better illustration of the growing complexity of the permit process atmosphere in the 1970s than the contentious story of Westway, the most significant un-built project in the recent history of New York City. It is also notable that this controversy surrounded a project in New York harbor, where so much New York District energy is expended. Westway, which started life as "Wateredge," was the proposal that developed in the late 1960s when the highway departments of New York City and New York State began examining options for rebuilding the West Side Highway, the elevated road that ran just inland of the series of piers along the western fringe of Manhattan. These officials wanted, among other things, to take advantage of the 80/20 federal/state financing formula offered by the Dwight D. Eisenhower National System of Interstate and Defense Highways (commonly called the Interstate Highway System). They viewed the project as a basis for reclaiming the declining waterfront, which had been losing maritime commerce, and replacing it with housing, parks, and commercial development.

In the early 1970s public distaste for expressways in general and the interstate highway system in particular was widespread in the New York metropolitan area. But the architects of Westway, who came mostly from the New York State Urban Development Corporation, thought their plan might be received differently because it would displace fewer people than any other urban highway in the interstate system. The Westway designers also believed the key to success lay in discussing the plan with the different communities and the various officials and civic organizations that might be interested in it. Over a period of roughly three years they held many public hearings and private discussions about the project. But 1973 saw two decisive events. First, the financial framework for the project was recast by Congress when it allowed municipalities to trade money committed to unbuilt segments of the Interstate Highway System for an equivalent amount of federal funds that could be spent on mass transit or less costly substitute roadways. Then, in December, the need for the Westway project took on renewed urgency when a tar-laden dump truck dropped through the old elevated roadbed and landed near West 12th Street, forcing closure of the highway south of 42nd Street.

The West Side Highway, also known as the Joe DiMaggio Highway, in the 1940s [undated postcard]

Rather than rebuild a highway in its old location, the Westway planners proposed to “drop it in the drink,” as one of them put it. They wanted to build two tunnels, each with three lanes and a shoulder, for 4.2 miles between 42nd Street and the Brooklyn Battery Tunnel, located at the southern tip of Manhattan Island. Above these tunnels, which would run along the western edge of the Hudson where decaying piers jutted out of the shoreline, they planned for 234 acres of new and reclaimed land, which, minus ramps and interchanges, would be divided roughly equally between a park and commercial development, and interspersed with some carefully-positioned residential complexes. The well regarded architectural and planning firm of Venturi, Scott, Brown, and Associates designed the park. Even some of Westway’s opponents applauded their design, which included an elegant central esplanade and created an entirely new shoreline that allowed public access to the river. On its eastern (landward) side the park was to be shielded by a wall from the clamor of city streets.

A collapsed section of the West Side Highway in Manhattan at 14th Street, circa 1974 [National Park Service]

Opposition to Westway was widespread and not just centered among residents of Greenwich Village, Chelsea, and Tribeca, the most affected neighborhoods. Though residents of these neighborhoods were mistrustful of the upscale commercial development slated for the water's edge, they mostly objected to the height of the proposed apartment buildings. These fears were calmed when the Westway team reduced the numbers of floors it proposed for these buildings. Around the city, it was more the incorporation of Westway within the interstate highway system (despite traffic engineering estimates that rush hour traffic would move at twenty miles per hour) that raised the hackles of New Yorkers, because interstates had earned a reputation for bulldozing neighborhoods and increasing pollution. Mass transit advocates opposed the plan because they thought the highway would simply bring more traffic into the city, and they preferred to see the hundreds of millions of federal dollars devoted to improving the city subway system. Finally, environmentalists objected to the 240 some acres of landfill that would encroach into the river, and to the luxury apartments slated to be built on some of the new land.

While the battle over Westway was the focus of extended public debate and media scrutiny, and ultimately brought a good deal of mostly unfavorable attention to the New York District, it was a project that actually absorbed the time of only a few district staff members. In April 1977 the district received an application from the New York State Department of Transportation for a permit to dredge, build an embankment, and place fill for the Westway project. In the course of evaluating this application, the district prepared an environmental assessment that described the Westway reach along the west side of Manhattan as "biologically impoverished" and nearly "devoid of macroorganisms." It was based on data from a study by the Federal Highway Administration and the New York State Department of Transportation (NYSDOT). Officials from the Environmental Protection Agency, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service, who all looked at the field study on which the district's assessment was based, came to different conclusions: all three agencies wanted the permit application denied, or at least subjected to further study. Nevertheless, in 1981, the district issued a permit for the proposed landfill.

Opponents sued New York State under the Clean Air Act, arguing that the state should not have issued an air quality permit – required due to the anticipated increase in automobile emissions – because as a highway project Westway would add to air pollution and waste more energy than a comparable mass transit project. In 1980 a federal magistrate, Thomas F. Griesa, dismissed the suit because the complainants had not shown that Westway would in fact increase air pollution. At that point it may have looked to both sides as if the project would go forward ... until some environmentalists noticed that striped bass were mentioned in passing in the district's environmental assessment. Striped bass were a commercially and recreationally important community of fish. Negative impacts on their habitat had recently been used as a basis for stopping one major Hudson River-edge construction project – Consolidated Edison's planned power plant at Storm King Mountain. Opponents, including some of the same individuals from the Storm King case, went back to court challenging the landfill permit granted by the Corps of Engineers on a number of grounds, including the environmental assessment's failure to fully address the potential effect of the Westway project on the striped bass population of the Hudson.

In December 1981 Judge Griesa whittled down to one the outstanding legal challenges to Westway. He threw out arguments over whether the government had adequately examined alternative routes, the trade-in of the federal Westway funds for mass-transit funds, and the possibility that the landfill could threaten New Jersey with flooding. But he let stand the single issue of whether the river's aquatic life had been adequately considered by the district. Westway's proponents remained optimistic. New York City's Assistant Transportation Commissioner asked sarcastically, ''When was the last time you had striped bass from the Hudson?" To him this was not a serious impediment: "The way is clear for Westway. It's a go-ahead," he predicted. But during the litigation that followed, the validity of the district's earlier conclusion that the area was biological wasteland was called increasingly into question. Investigations funded by the New York State Department of Transportation (NYSDOT) showed that the piers were a winter habitat for young striped bass. Destruction of the piers might break up the bass's migration between their spawning areas upriver near Peekskill and the Atlantic coastal waters where they spent most of their adult lives.

In April 1982, the United States Court, Southern District of New York nullified the permit, ruling it was in violation of the National Environmental Policy Act, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act of 1899. If NYSDOT reapplied, the court instructed the New York District that it would need to prepare a supplemental environmental impact statement (EIS) that dealt adequately with the impact of the proposed project on the Hudson River striped bass population. The Court further directed the district to conduct an independent analysis of all available data on fisheries in the Hudson River and, if necessary, to conduct additional studies to ascertain the importance of the Westway inter-pier area to the fish of the Hudson. "I think if we go back in retrospect,'' Lieutenant General Joseph K. Bratton, the Chief of Engineers, testified later, "we certainly could have saved a lot of time if fish studies and a different environmental impact statement had been made in 1977 and 1978."

New York State renewed its application for a permit shortly after the ruling. From May to December 1982 the district discussed the issue with relevant agencies and consultants. In December, district engineer Colonel Walter Smith decided further study was not necessary. He directed the district staff to write a supplemental EIS based on existing data. In March 1983 Colonel F.H.

The striped bass: the fish that stopped the Westway

"Bud" Griffis replaced Colonel Smith as New York district engineer and soon reconsidered Colonel Smith's judgment about the need for further study. In July 1983 Colonel Griffis convened a large conference on striped bass with all relevant parties represented including as many experts as the district could find. Consensus emerged from this meeting on two points. It would take at least two years of study to measure the proportion of Hudson River striped bass that used the Westway inter-pier area; and, once this was known, current science still had no way to predict what would happen to these fish when they were displaced by Westway. In September 1983, Griffis announced his conclusion that the Westway landfill could have a serious environmental impact because the fill would destroy an important over-wintering habitat of juvenile striped bass. He called for an additional two years to study the impact the project might have on the striped bass population.

Delay favored Westway's opponents. The estimated project cost had already doubled to $2 billion, and the two-year study Colonel Griffis called for would have stopped preparatory work on the project because federal highway administrators would not fund any more preliminary work on Westway until there was greater certainty that the project would be completed. As an opponent put it, the longer the project was "left out in the street, the more it's going to get kicked." City newspapers were livid. The *Daily News* called the decision another example of how "petty environmental rules and legal stalling can jeopardize a development of enormous public value." New York Governor Mario Cuomo appealed the decision to the Assistant Secretary of the Army (Civil Works), who claimed an "inherent authority" to order a *de novo* review. In December, the Chief of Engineers authorized one winter for data collection rather than two. This was the worst of both worlds from the point of view of the biologists. Since one winter's study could easily produce anomalous results, it was not enough time to establish any meaningful patterns of habitat usage. But because the study would be based on an additional year's data it could give the appearance of having a higher level of scientific reliability than it actually had. For them it was either two years of study or rewrite with what they had.

The district released a draft supplemental EIS based on one winter of new data in May 1984. It held a public hearing at Madison Square Garden's Felt Forum in June, and in August it extended the public comment period, aiming to issue the final document in November. The final supplemental environmental impact statement (FSEIS) concluded that an upper limit of between one quarter and one third of the juvenile striped bass population of the Hudson might be displaced by Westway, although, because its fill area was not unique but one of a number of inter-pier and other low current areas through which striped bass pass in their migration, the project would not have a major adverse effect on the estuary's overall striped bass population.

Soon after the public comment period on the FSEIS closed in January 1985, Colonel Griffis announced that he would issue the permit. In support of his decision, Griffis explained that there was no alternative to the Westway project that furnished all its benefits: access to the waterfront; new parkland; improved transportation; housing; and commercial development. For the district these positives far outweighed the negative of environmental risk. While it was sensitive to the concern that the project posed a danger to the Hudson River striped bass population, it did not think the data supported the dire effect that Westway opponents were suggesting. Griffis signed the permit in February and the Westway opponents went to court almost immediately, making a number of arguments. Most important was their claim that the district conclusion that the project would have no unacceptably great adverse impact on the striped bass was "arbitrary and capricious."

Following an eight-week trial, Judge Griesa, the same judge who had ruled against the Westway opponents in their original Clean Air Act suit, issued a lengthy decision in August, upholding all the plaintiffs' arguments and imposing a permanent injunction on the Corps of Engineers – prohibiting the district from granting a permit for the project, prohibiting the Federal Highway Administration from funding it, and prohibiting New York State from building it. The federal defendants and New York State appealed to the Court of Appeals for the Second Circuit, which ruled in September. The Second Circuit overruled Judge Griesa on many counts, but it upheld him on one key element – the effect of the project on the striped bass.

During the course of the district's work on the problem of the striped bass its approach to the subject evolved. While drafting the supplemental EIS, the district first assumed that the Westway fill area had special significance to juvenile striped bass as an area where they acclimatized themselves to the environment beyond the river into which they would soon be moving. As its understanding of the behavior of the fish advanced, however, the district abandoned this staging area idea; instead it came to the see the Westway inter-pier area as just one of a few low-current areas through which the young fish pass. In addition, during the course of the work the district changed the way it used the term "significant." In the draft, the term had been used, much as scientists used it, to mean "measurable." But in the guidelines to Section 404 of the Clean Water Act "significant" is defined as "large." The district dropped the use of the term "significant" in the Final Supplemental EIS – but not because its conclusion had changed between Draft and Final EIS documents, or to lessen the effect of its conclusion. In both documents the district had intended its argument to be that the impact on the striped bass would be measurable, but not large.

The Appellate Court upheld the lower court on the issue of the adequacy of the district's explanation of the difference in language between the Draft and Final Supplemental EISs. The district had failed to persuade the Court that its view did not really change between the draft and final documents. The Court rejected the Corps of Engineers' explanation that "significant" was a scientific term, while "minor" was a legal definition within the context of environmental statutes. "They [the judges] hung their hat on that word 'significant' that was in the draft" said Colonel Griffis.

Retrospective opinions differ on Westway. Some officials are convinced that the New York District could have made the Court understand that it was not trying to soft-pedal an earlier finding of a large adverse impact. Others feel that with enough time to study it properly, the district could have demonstrated that the striped bass population would adapt to the disruption of its habitat and it could therefore have issued a valid permit the courts would have supported. Some others are not so sure about this because the most likely place for the bass to go was to the New Jersey side of the river, where a great deal of construction was planned. In any event, with the deadline looming for any possible trade-in of highway for mass transit funds, New York State Governor Cuomo and New York City Mayor Edward I. Koch were unwilling to gamble on the uncertain outcome of another environmental review. They threw in the towel. For better or worse, Interstate Route 478, Westway's official designation, died. "The Corps of Engineers made a big mistake, but that didn't stop the thing by itself," Governor Cuomo commented. "There was a whole confluence of factors." While some of the Westway money did get spent in New York City on mass transit as well as on other road and bridge repairs, most of it ultimately went to the "Big Dig" project in Boston, where an older highway was replaced with a tunnel under the downtown.

HACKENSACK MEADOWLANDS

There is a difference of opinion on the question of why Congress divided agency responsibilities under the Clean Water Act and the Ocean Dumping Act between the Corps of Engineers and the EPA. Many Corps of Engineers professionals, along with most developers and the dredging industry, saw Section 404 of the Clean Water Act as a "carve out," an exemption from the EPA's otherwise complete authority over water quality, because under the Rivers and Harbors Act of 1899 the Corps had been issuing dredge and fill permits for nearly one hundred years. The environmental community saw it differently. The role of wetlands as the "kidneys" of the hydrologic cycle and their importance in preserving water quality was becoming increasingly clear. Environmentalists recognized that a broad understanding of interconnected waterways, such as small streams and riparian and tidal wetlands, was necessary to truly protect rivers from pollution. They knew that dumping dredged material could harm crucial aquatic and wetlands ecosystems, and that the Corps of Engineers' technical expertise and its years of experience issuing permits could be extended beyond a narrow definition of navigable waters.

These different expectations help to explain why the New York District increasingly came to find itself at the nexus of competing interests. To some critics, the Corps seemed overly concerned with its new environmental responsibilities; to others, it had not really left behind its old alliances with the shipping, building, and other industries.

Few people appreciate the tension that can be generated by the conflicting interests of many stakeholders. It is sometimes facetiously said that the only option is to hope everyone is equally displeased. The district's efforts at achieving balance among the stakeholders in the Hackensack Meadowlands in northeastern New Jersey is a good illustration of the bureaucratic tension that built up around the topic of wetlands permitting.

The Hackensack Meadowlands lie in a trough between the Palisades ridge and the First Watchung Mountain. Their marshy character is a result of the advance and retreat of the Wisconsin ice sheet, which spread clay and glacial till over the ground surface, filling in valleys and cloaking ridges. Between 15,000 and 12,000 years ago, the terminal moraine that extended west from Long Island across Staten Island to Perth Amboy and then headed generally northwest to Belvidere in Warren County, New Jersey, created Glacial Lake Hackensack by serving as a dam for glacial meltwater. As the ice sheet began its final retreat, approximately 10,000 years ago, the massive glacial lake began to drain, slowly turning its sea-level bed into a spongy, freshwater bog. The Hackensack River, the Meadowlands' watery spine, is a remnant of this great glacial lake. As the sea continued to rise, the marsh was invaded by increasing amounts of tidally-influenced seawater.

A view looking northeast across the Hackensack Meadowlands and the Hackensack River in New Jersey toward the Bergen ridge and the Hudson River, circa 1990 [New Jersey Meadowlands Commission]

The Hackensack Water Company dam on the Hackensack River at Oradell, circa 1990 [New Jersey Meadowlands Commission]

Only a century ago, the Meadowlands covered more than twice their modern area. In 1897 there were 18,580 acres (more than twenty-nine square miles) of tidal marsh and 1,465 acres of freshwater meadows in the Meadowlands region. There are three principal reasons for the decreasing size. Much of the marsh and meadow was filled to create dry land for building; large sections of Newark and Elizabeth, for example, are built on former marshland. Secondly, as nearby towns and cities grew, marshes were drained in an effort to control the mosquito population. Lastly, in 1922, the Hackensack Water Company built the first of three dams that reduced the freshwater flow from the Hackensack River. For these and other reasons only around 8,400 acres (just over 40 percent) of the late nineteenth-century wetlands and aquatic habitats now remain in the lower Hackensack River Basin.

Approximately half the soil in the Meadowlands is a compressible, highly organic silt and clay known as tidal marsh soil. Because of this spongy marshy terrain, most structures require expensive pile-supported foundations, and for many years developers avoided this area, building suburbs in and eventually beyond the Watchungs before doubling back to the Meadowlands. The physical environment provided its own brake on economic development in the area, which was left to pig farmers whose livestock fed on the tons of garbage dumped there each year. New Jersey health authorities drove the pig farmers from Secaucus in 1958, and the pace of building picked up soon thereafter. While some technical improvements were made in the driving of pile foundations, the main impetus was the increasing value of real estate so near to New York City. The price of an acre of land began to reach the point where the considerable cost of site preparation tasks such as driving piles to ninety or one hundred feet below the surface were no longer an impediment to profitable land development.

The state of New Jersey created the Hackensack Meadowlands Development Commission (HMDC) in 1969 to balance environmental and developmental concerns, as well as manage the vexing problem of solid waste disposal. This agency became the New Jersey Meadowlands Commission in 2001. The area of the Commission's jurisdiction encompasses parts of ten municipalities in Bergen County and four in Hudson County; its 19,485 acres compose an area nearly 30 percent larger than the island of Manhattan.

A conceptual rendering of residential development within the Hackensack Meadowlands

In its first year the HMDC introduced a master plan that was received unfavorably by environmentalists and open space advocates who objected to the amount of land the plan left open to development. The Commission then imposed a two-year moratorium on construction on 10,000 acres under its jurisdiction while it reconsidered. The revised plan, released in November 1972, set aside 6,150 acres, almost a third of the entire region, for open space. It devoted roughly 8,000 acres to research parks, light industry, and commercial uses such as shopping centers; and it limited the amount of new housing in the area to locations which could accommodate 125,000 people, to be built in "island residential complexes" remote from industry and contiguous to parks and recreation.

The first firm to take advantage of the master plan's housing ideas was Hartz Mountain Industries, the real estate arm of the nation's largest pet food manufacturer. Hartz Mountain, which bought 750 acres in the Meadowlands in 1968 and another 500 a few years later, proposed to build 640 town houses on the Hackensack River in Secaucus by constructing a series of finger-like embankments into the navigable waters of the river and creating dry land in the interstices by filling them with 630,000 cubic yards of material. These plans duly received a permit from the New York District under Section 10 of the Rivers and Harbors Act of 1899. Hartz Mountain soon became the biggest developer in the Meadowlands. The town houses complex, named Harmon Cove, grew to be a $300-million, 1,200-unit project that included a number of high-rise apartment buildings.

The Hartz Mountain Harmon Cove development, Secaucus, New Jersey, circa 1995

In 1979 Hartz dropped plans for a mall and office complex after a two-year battle for approvals, because a rival developer's plan was deemed more consistent with the HMDC master plan. A few years later Hartz introduced a variation of its 1979 plan as a $750-million proposal for a complex of offices, warehouses, and stores. When the New York District issued a permit for this project in January 1983, the National Audubon Society sued the Corps of Engineers for failing to consider cumulative impacts in its environmental impact statement. The district's environmental study was upheld, however, and Harmon Meadow, a multi-use complex that included restaurants, movie theaters, a shopping mall, and office buildings, including Hartz Mountain's own headquarters, soon rose up from the marshes north of Route 3.

In return for permission to fill in wetlands for Harmon Meadow, the New York District insisted that Hartz Mountain restore a marsh north of Harmon Meadow at the confluence of Mill Creek and the Hackensack River. This was the first local implementation of the "no net loss of wetlands" policy developed by the Corps of Engineers and the EPA, which was adopted in 1989 by the administration of President George H.W. Bush. But this outcome left both sides uneasy. Hartz Mountain reluctantly spent roughly $5 million on the restoration, which was later judged an environmental success, complaining in the press that the state not the federal government should be setting land use policy. The Environmental Defense Fund, which had sued unsuccessfully to stop the entire project, remained leery of this kind of mitigation – trading a negative development impact here for an environmental improvement there. Other environmentalists accepted the basic principle of mitigation trade-offs, but questioned this one because the area that was turned into wetland had already been a healthy stand of trees. They wondered about the net environmental gain in trading an already ecologically viable area for a new wetland in order to make up for the loss of wetlands elsewhere.

In the mid-1980s a stand-off was taking shape in the Meadowlands. Nationwide, the protections afforded to wetlands through their implementation of the terms of the Clean Water Act were broadening. The EPA, which had generally been approving Corps of Engineers wetlands permits, began taking more seriously the provision that applicants for permits to fill wetlands must show there are no viable alternatives. In the Meadowlands builders were losing confidence that the zoning in the HMDC master plan would be upheld and environmentalists were uneasy about the amount of development they had witnessed in the area. In 1982 the amount invested in the Meadowlands since the Commission was established crossed the $1-billion threshold, and by 1987 it was over $1.5 billion. The HMDC hailed this as a success beyond all reasonable expectation, but many observers wondered what had happened to the talk of preserving the last great open space in the New York metropolitan area, a key goal of the Commission at the time of its creation.

Despite the building boom in the Meadowlands having opened with Hartz Mountain's Harmon Cove housing project, most of the subsequent development was commercial rather than residential. A growing housing shortage now threatened to stymie further commercial development. In 1985 Hartz Mountain proposed the Villages at Mill Creek, a 2,800-unit residential project that included 20 percent affordable housing as required by state standards. The plan put the homes alongside a series of shallow canals and lagoons to be constructed along Mill Creek, a winding tributary of the Hackensack River. The National Audubon Society sued, and while the permit the district granted for this project was ultimately upheld in court, bitterness over its issuance set the stage for what followed.

Back in 1984, the Mills Corporation, a mall developer from Arlington, Virginia, proposed a project called Meadowlands Mills, which required filling 206 acres to create land on which to build a mixed-use development including a massive retail center, offices, a hotel, and other uses. Environmentalists objected strongly to the Meadowlands Mills proposal and they fought this permit vigorously, making developers in the area nervous. Predictability is vital to developers. The HMDC master plan was designed

The Villages at Mill Creek development in Secaucus, New Jersey, circa 2000 to provide it. But now it was beginning to appear as if the Meadowlands could become an area where developers, after incurring considerable expense, might not know what to expect from their applications for permits.

When New Jersey established the Hackensack Meadowlands Development Commission in 1969, 1,200 acres (almost two square miles) of land were not subject to its regulations because it was owned by potential developers prior to the Commission's creation. As the standards for permits grew increasingly strict, the owners of this land became anxious they might lose the ability to build on it. With voices on all sides crying for a better planning process, New Jersey's Congressional delegation took notice, and the federal Council on Environmental Quality was drawn into the issue as well. Eventually, the Corps of Engineers, the EPA, the HMDC, the New Jersey Department of Environmental Protection, the National Oceanic and Atmospheric Administration, and the U.S. Fish and Wildlife Service, signed a Memorandum of Understanding to prepare a "Special Area Management Plan" (SAMP) for the area under the jurisdiction of the HMDC. Special Area Management Plans, as defined in the federal Coastal Zone Management Act of 1972, were intended to provide a plan for natural resource protection and reasonable economic growth by systematically defining the "standards and criteria" for land use planning in the area. The Coastal Zone Management Act applied here because the HMDC's area is within New Jersey's coastal zone.

It took seven years to develop the SAMP, an indicator of just how contentious the atmosphere was. The special area plan, essentially an overlay on the HMDC master plan, recommended developing 842 acres (70 percent) of the 1,200 acres that were the principal focus of attention, including 365 acres at the Empire Tract, as the proposed location of Meadowlands Mills was known. The district was optimistic about the plan when it was released in June 1995, believing it could serve as a national model of how government, property owners, environmentalists, and developers might agree on a plan for managing natural resources and economic growth. District engineer Colonel Gary Thomas, who had just arrived in New York, hailed it as an innovative and balanced way to resolve the gridlock that was preventing progress. But balance is in the eye of the beholder. Richard Kane of the New Jersey Audubon Society was not so happy. He told the Newark *Star-Ledger* that the plan should have preserved "most, if not all, the wetlands," and limited development to upland sites or reclaimed areas. Others did not go as far as Kane, but felt nonetheless that opening 840 acres of wetlands (an area the size of New York City's Central Park) to development was too much. Many voices suggested that redevelopment in Newark and other declining cities made more sense than building from scratch in areas possessing actual or potential environmental quality.

As the debate over the SAMP progressed, the Mills Corporation did not sit idly by. It re-introduced its proposal for what would be the largest shopping center in New Jersey – a $1-billion, 594-acre mall – and the second biggest project in the Meadowlands after the 750-acre Meadowlands Sports Complex, built in 1974. The mall would contain 2.4 million square feet of retail space, roughly a quarter of which would be entertainment rather than shopping, more than two million square feet of office space, restaurants, 1,000 hotel rooms, parking for 17,000 cars, some light industry, and other elements. A 5,700-unit housing element was dropped from the project to remove the objection of the Borough of Carlstadt. The proposal still included filling 206 acres of wetlands on the Empire Tract, a feature of the original Meadowlands Mills project presented in 1984. In the summer of 1999 the New York District, which had issued thirty-four permits for filling wetlands in the Meadowlands between 1977 and 1997, released an EIS that was favorable to the project, but the EPA called on the Corps to deny the permit. The EPA was joined in its criticism of the project by a number of local environmentalists who were coming to see the HMDC as essentially pro-development.

The Meadowlands Mills project was complicated enough on its own terms, before it became part of a protracted struggle over the fate of the Meadowlands Sports Complex, which was at risk of losing some or all of the four professional sports teams that used its arenas. Governor Christine Todd Whitman did not take a position on Meadowlands Mills before she left Trenton in early 2001 to become administrator of the Environmental Protection Agency under President George W. Bush. Acting Governor Donald T. Di Francesco, who opposed the project, urged the Mills Corporation to put it on the Meadowlands Sports Complex site, but the developer declined this suggestion because the plot of land was not large enough.

The Meadowlands Sports Complex in the heart of the Hackensack Meadowlands, Bergen County, New Jersey, circa 2000

In what seemed like an anti-climax to all but those who had worked hard to bring it about, the SAMP for the Meadowlands died officially in February 2002, when the New Jersey Meadowlands Commission withdrew as the local sponsor because "all good efforts have been exhausted" to find consensus on a plan. A Meadowlands Interagency Mitigation Advisory Committee continues to meet and discuss coastal zone and wetland permit issues.

In September 2002 the New Jersey Sports and Exposition Authority, which owned the Meadowlands Sports Complex, received six proposals for redeveloping the sports complex site. Each one was more fanciful than the next, but they all involved some combination of stores, offices, hotels, restaurants, and entertainment venues. There were two leading contenders: a plan called Expo Park, presented by a joint venture of Hartz Mountain Industries and Forest City Ratner, a Cleveland-based developer; and a plan called Xanadu, put forward by the Mills Corporation and Mack-Cali Realty Corporation, an office park developer from Cranford, New Jersey. Expo Park, with an estimated cost of $815 million, included a convention center, a Formula One race track, and 1,200 hotel rooms. Xanadu, with an estimated cost of $1.2 billion, included a retail complex, indoor skiing and surfing facilities, a Formula One race track, a minor league baseball stadium, a child-scale city for children, and other elements.

The Sports and Exposition Authority selected Xanadu, and when skeptics questioned the grandiose plans, Laurence C. Siegel, the Mills Corporation chief executive officer, cited the comparatively high average income of the sixteen million people who lived within a twenty-mile radius of the site. "This is the best piece of dirt in the U.S." he proclaimed. Many of the participants in the debate over the fate of the undeveloped areas in the Meadowlands agreed, but for different reasons. The New Jersey Meadowlands Commission gave its conditional blessing to Xanadu in August 2004.

Two months later Xanadu formally unveiled its plans, and the terms of the 175-year lease the developers negotiated with the Sports and Exposition Authority were made public. The most salient element here was an agreement that the Authority would pay the Mills Corporation $26 million for the nearly 600 acres of the Empire Tract. In March 2005 the New York District issued a permit to the Xanadu partnership allowing it to fill just under eight acres of wetlands, the loss to be mitigated by the developers paying the Meadowlands Commission to enhance roughly fifteen acres of wetlands adjacent to Secaucus High School. Issuing the permit also triggered the transfer of ownership of the Empire Tract, for which the Mills Corporation had been paid, to the Meadowlands Conservation Trust for perpetual protection. Within a month Hartz Mountain, the Borough of Carlstadt, and the Sierra Club of New Jersey brought individual lawsuits, charging insufficient assessment of the project's impact on air quality, traffic, and wetlands. Their requests for an injunction were denied, and within a few months all the suits had been dismissed.

In the late spring of 2006 work was under way on the sprawling Xanadu project, as ominous clouds gathered around it. The Mills Corporation, which was under fire from shareholders and the Securities and Exchange Commission for an assortment of financial irregularities, announced the project would cost more and take longer than its original projections. The company was short of cash, and had reached agreements with only a handful of the anticipated 200 tenants.

The New York District's involvement in the Meadowlands reflects a historical pattern observable in its regulatory work generally. Thirty to forty years ago a developer who applied for a permit to fill in wetlands in order to create dry ground on which to build something would generally not receive much critical scrutiny; nor did a dredger, or someone who wanted to dispose of dredged material in the ocean. The level of sophistication and detail required of environmental testing and environmental assessments or impact statements gradually increased during the decades, but permits were usually issued. Permitting in the 1990s, however, grew increasingly contentious, as the Meadowlands Mills case demonstrates. The case for the preservation of wetlands grew stronger and regulators responded. By the turn of the new millennium there was widespread consensus about the value of wetlands, if not always agreement on precisely what to do to balance environmental and developmental concerns.

OTHER PERMITTING CASES

Another permit problem that thrust the New York District into the headlines arrived in 1988 and suggests how delicate the process can sometimes be. Under court order to reduce overcrowding in its jails, New York City purchased two barges that had been used by the British to barrack troops during its 1982 war with Argentina over control of the Falkland Islands. The city housed its overflow prison population in these barges and moored them in the harbor, one on the lower east side, and one adjacent to Greenwich Village. But it had not obtained the permit that is required to moor vessels in navigable waters for periods of longer than six months. This put the district in the middle of a tense argument. The city warned that if the district did not issue the permit it would bear the responsibility when prisoners were released on to the streets, and its supporters threatened to sue over what they considered excessive delays in the permitting process that were jeopardizing citizen safety. On the other side, neighborhood groups did not want the prisoners in their backyards, and environmentalists objected to the permit on a number of grounds, including continuing uncertainty over the length of time the barges might be needed, because the five boroughs had not agreed on a comprehensive plan. These opponents threatened to sue the district for violating federal law and its own regulations if it issued the permit. The district maintained a dialogue seeking terms of compromise that would keep both sides from suing until finally in February 1992, after four years, the city announced it would remove the prisoners and sell the barges.

One other sensational permit story underscores the importance of follow-up monitoring and enforcement. In the case of large applications, such as major energy infrastructure projects, the district may impose conditions when it grants permission to build. But if permits are to be awarded conditionally, the district needs a way to ensure the terms of the conditions are actually met, as an application from the Iroquois Gas Transmission System demonstrates. Iroquois Gas was a Connecticut-based consortium of twelve Canadian and American energy companies and state power authorities. The partners applied for permits to build a 370-mile-long underground pipeline, from Waddington, New York on the St. Lawrence River near Ogdensburg, to South Commack on Long Island. Among the navigable waterways in which the consortium proposed to build were the St. Lawrence Seaway, the Mohawk and Hudson rivers in New York, the Housatonic River in Connecticut, and a twenty-six-mile stretch of Long Island Sound between Milford, Connecticut, and Northport, Long Island.

In February 1991, after a difficult four-year review, the New York District granted the Iroquois Gas pipeline project a permit despite opposition from a citizen's group called the GASP Coalition and concerns about the environmental impact of the project raised by the EPA. The district imposed eighteen special conditions on the applicant, including monitoring, all aimed at reducing the pipeline's environmental damage. With an estimated cost of over $500 million the project was on a tight schedule because the TransCanada Corporation, who would be selling the gas to Iroquois, insisted on a stiff penalty clause in the contract. Failure to meet the contract deadline would have been very costly to the consortium, and its contractors consequently began cutting corners. Eventually someone concerned about the safety of the pipeline blew the whistle. The criminal investigation that ensued, which included re-excavating portions of the pipeline, uncovered serious infractions: contractual specifications were undercut; basic safety codes were violated; and the conditions of the permit were ignored. Ultimately the investigation resulted in criminal convictions, over $20 million in fines, and mandated wetlands restorations. This case caused the district to redouble its compliance efforts.

The era of environmentalism thrust the permitting and regulatory arm of the Corps of Engineers into new realms. In the early 1970s the district issued permits to undertakings so long as they did not impede navigation. Two major environmental laws enacted in 1972 broadened the district's regulatory purview. The Ocean Dumping Act required the district to assess the environmental impact of every offshore dumping project within its boundaries. The Clean Water Act required the district to assess the impact on navigation, wildlife, fish, pollution, aesthetics, ecology, and the general public interest of every proposal to dredge, fill, or build in or near navigable water. In 1977 Congress expanded this mandate to include wetlands "adjacent" to and even "isolated" from navigable waterways. This legislation made it necessary for the district to learn how to balance its customary support for industry and development with its new environmental responsibilities. It was not an easy adjustment. The near-decade-long controversy over granting a permit to Westway – a project that proposed replacing the decaying West Side Highway with a four-mile-long, six-lane roadway situated in tunnels along the southwestern edge of Manhattan Island – epitomized the difficulty that surrounded the district's efforts to adapt to the new regulatory milieu.

Eventually the district learned how to use its regulatory arm as an honest broker between the demands of commerce and industry on the one hand and the need to protect the environment and preserve open space on the other. But its failure to get agreement from the interested parties to a Special Area Management Plan for northeastern New Jersey's vast meadowlands was a reminder that sometimes competing interests cannot be talked into compromise. The Iroquois Gas Transmission System case illustrated the need for scrutiny of compliance with conditions put on permits for projects. By late 2006, the Corps' regulatory program had evolved into a complex balancing act of representing the public interest by protecting the nation's water resources, including wetlands, without unduly frustrating economic development.

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In addition to the sources listed below, formal oral history interviews were important sources of information for this chapter. Leonard Houston, who first came to the New York District to work on the court-mandated supplemental environmental impact statement on Westway, discussed the case at length. Houston also provided insights into the Meadowlands efforts. Thomas Creamer discussed the evolution of the permitting branch. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. An extended conversation with Colonel F. H. "Bud" Griffis, Commander, U.S. Army Corps of Engineers, New York District from 1983 to 1986, was most helpful in developing an understanding of the Westway project. Informal conversations with a number of other current and former district staff, particularly Robert Kurtz, Joseph Seebode, and William Slezak were also crucial for this chapter.

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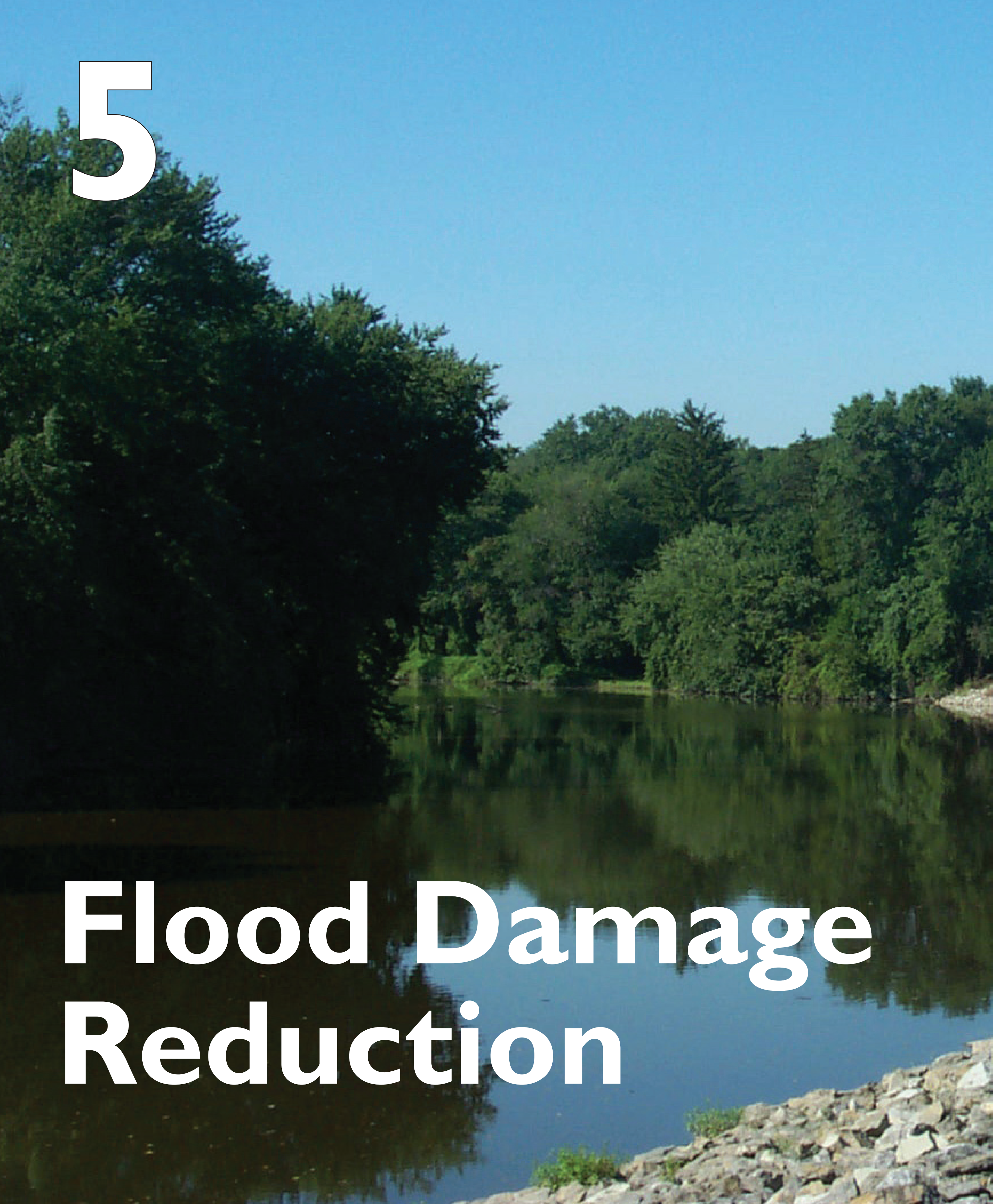
5

Flood Damage Reduction



The New York District's civil works boundaries include a number of densely populated, flood-prone areas and, as a result, efforts directed at combating flooding were an important element of the district's portfolio throughout the second half of the twentieth century. Over the last thirty years the names of many district flood-related projects have changed, reflecting an evolving sense of what can be accomplished. In the 1970s these efforts were typically called "flood control projects;" later they were termed "flood protection" and, most recently "flood damage reduction" projects. All of these labels, however, in one way or another, imply an ability to manipulate a natural process. In 2006 there were roughly forty flood damage reduction projects listed on the district's web pages.

Flood control works along the Saw Mill River in Westchester County, New York

While there are earlier antecedents, Congress gave the U.S. Army Corps of Engineers its major flood control mission in 1936. Following the Flood Control Act of that year, the New York District commenced its involvement with flood problems in the Passaic River basin, but otherwise over the next few decades flood damage protection represented only a small part of the district's work, even though its geographic area of responsibility lies along a North Atlantic storm corridor that produces a lot of weather with the potential to cause flooding.

Flooding is as natural as the storms that cause it. In most cases a flood is part of the natural dynamics of a river basin's ecosystem. Floods become "problems" that require solutions when people build in low-lying areas and do not want to see the results of their labors inundated by the rising and swirling swells of brown floodwater. Four different kinds of rainstorms may lead to floods in the northeastern United States. Tropical storms (or hurricanes if their wind velocity is strong enough) originate in the Atlantic Ocean based on wind patterns in Africa; they generally reach the mid-Atlantic United States via the Caribbean. Extra-tropical storms such as northeasters usually start in the Gulf states or the Ohio Valley before reaching the Atlantic coast. Regional storms of less intensity but longer duration can drop rain for an extended period of time which may lead to flooding, especially if the precipitation falls on already snow-covered, frozen, or saturated ground. The fourth storm type, the local thunderstorm, has caused some of the area's worst floods in specific locations. While inland flood problems can sometimes be exacerbated by tidal patterns, this chapter deals only with riverine flooding. Coastal flooding is dealt with in Chapter 7.

During the hurricane seasons of 1954 and 1955 six hurricanes hit the Atlantic coast in a thirteen-month period, killing hundreds of people and damaging or destroying millions of dollars worth of property. One of these, Hurricane Diane, brought heavy rains to the already saturated northeastern United States in August 1955. Flooding was extensive in Pennsylvania, New Jersey, New York, and throughout New England. In Diane's aftermath Senator Prescott Bush of Connecticut initiated a resolution in the Senate Public Works Committee calling on the Corps of Engineers to investigate possible flood control measures on all the rivers and streams that lay in the hurricane's path. This led to a number of studies by the New York District, among the most important of which involved the Green Brook sub-basin in New Jersey and the Saw Mill River basin in Westchester County, New York. However, initially, studies in these two relatively large watersheds resulted in no immediate action.

Several smaller drainages in New York and Massachusetts were also studied in the wake of Hurricane Diane. Flood control projects were completed, as a result, in the mid-1970s at Adams, Massachusetts, along the Hoosic River, and Rosendale, New York, on Rondout Creek. Also, in the mid-1970s the feasibility of providing overflow protection from the Mohawk River and Bellinger Brook in Herkimer, New York was under study. Another Mohawk River project

A SUMMARY OF RECENT NEW YORK DISTRICT FLOOD CONTROL PROJECTS

NEW JERSEY

Green Brook Sub-basin • Flood Damage Reduction • Construction Phase

Passaic River • Preservation of Natural Storage Areas • Flood Damage Reduction • Construction Phase

Passaic River, Minish Park, Newark • Flood Damage Reduction • Construction Phase

Hackensack Meadowlands • Flood Damage Reduction • Feasibility Phase

Ramapo River, Oakland • Flood Damage Reduction • Construction Phase

Upper Passaic River & Tributaries • Flood Damage Reduction • Construction Phase

Hudson-Raritan Estuary-Lower Passaic River • Ecosystem Restoration • Feasibility Phase

Hudson Raritan Estuary-Hackensack Meadowlands • Ecosystem Restoration • Feasibility Phase

Poplar Brook • Flood Damage Reduction • Feasibility Phase

Jackson Brook • Flood Damage Reduction • Feasibility Phase

Ramapo River, Mahwah • Flood Damage Reduction • Design Phase

Passaic River, Harrison • Flood Damage Reduction • Design Phase

Peckman River Basin • Ecosystem Restoration/Flood Damage Reduction • Feasibility Phase

South River, Raritan Basin • Ecosystem Restoration/Flood Damage Reduction • Feasibility Phase

Lower Saddle River • Flood Damage Reduction • Design Phase

Millstone River Basin • Ecosystem Restoration/Flood Damage Reduction • Feasibility Phase

Upper Rockaway River • Flood Damage Reduction/Ecosystem Restoration • Feasibility Phase

Rahway River Basin • Flood Damage Reduction/Ecosystem Restoration • Feasibility Phase

Shrewsbury River • Ecosystem Restoration/Flood Damage Reduction • Feasibility Phase

Elizabeth River • Flood Damage Reduction • Pre-construction Design & Analysis

Mill Brook, Highland Park • Flood Damage Reduction • Plans & Specifications

Sparkill Creek, Northvale • Flood Damage Reduction • Preliminary Restoration Plan/Initial Appraisal

Acid Brook, Pompton Lakes • Flood Damage Reduction • Preliminary Restoration Plan/Initial Appraisal

Passaic River Basin • Flood Management (Floodway Buy-out) • Flood Damage Reduction • Construction Phase

Passaic River (Main Stem) • Flood Damage Reduction • Design Phase

Elizabeth River • Flood Damage Reduction • Construction Phase

Malapardis Brook, Hanover • Flood Damage Reduction • Pre-construction Design & Analysis

Woodbridge River Basin • Flood Damage Reduction/Ecosystem Restoration • Feasibility Phase

South Branch, Rahway River • Flood Damage Reduction • Pre-construction Design & Analysis

NEW YORK

Blind Brook Watershed • Initial Flood Plain Management Services

Moyer Creek • Feasibility Phase • Flood Damage Reduction

New York City Watershed • Flood Damage Reduction • Construction Phase

Ramapo and Mahwah Rivers, Mahwah and Suffern • Flood Damage Reduction • Construction Phase

Saw Mill River, Elmsford and Greenburgh • Flood Damage Reduction • Design Phase

Hudson River Habitat Restoration • Flood Damage Reduction • Feasibility Phase

Wynantskill Creek, North Greenbush • Flood Damage Reduction • Construction Phase

Wallkill River, Rosendale • Flood Damage Reduction • Construction Phase

Sacandaga River, Wells • Flood Damage Reduction • Feasibility Phase

Steele Creek • Flood Damage Reduction • Feasibility Phase

VERMONT

Waterbury Dam, Waterbury • Flood Damage Reduction • Construction Phase in Rome, New York, was stalled for lack of a commitment from New York State.

In the half century following Hurricane Diane, the New York District's population increased by roughly 20 percent. But it was not so much a matter of how many extra people came to live within the civil works boundaries that heightened the risk of flood damage; it was more a matter of where people, newcomers and long-time residents alike, actually lived. During the years after World War II an extraordinary redistribution of population occurred within the New York metropolitan area. Older industrial towns lost population as the suburbs expanded. While district-wide in 2005 roughly twenty million people lived where seventeen million had a half century earlier, population in the floodplains of rivers like the Saw Mill and the Passaic, and within the entire Green Brook sub-basin, grew by proportionately much greater amounts. In Westchester

Flooding in the Green Brook sub-basin: Bound Brook in the wake of Hurricane Floyd, September 1999

THE CONTINUING AUTHORITIES PROGRAM

Under the continuing authorities program (CAP), Congress provides the U.S. Army Corps of Engineers the following nine standing authorities to study and build various water resource projects that meet specified budgetary and other conditions. Such projects can be advanced without the need to obtain specific Congressional authorization.

Emergency Streambank and Shoreline Protection
Section 14 of the Flood Control Act of 1946 protects public facilities in imminent danger of major damage. In 2006 the 65 percent federal share of project costs could not exceed $1 million.

Small Flood Control Projects
Section 205 of the Flood Control Act of 1948 provides for local protection from flooding by construction or non-structural means. The 65 percent federal share of overall project cost may not exceed $7 million per project.

Snagging and Clearing for Flood Control
Section 208 of the Flood Control Act of 1954 provides for channel clearing, excavation, and limited embankment construction for flood damage protection. The 65 percent federal cost share may not exceed $500,000 per project.

Small Navigation Improvements
Section 107 of the Rivers and Harbors Act of 1960, provides for improvements to navigation: the 80 percent federal share is not to exceed $4 million per project.

Hurricane and Storm Damage Reduction
Section 103 of the Rivers and Harbors Act of 1962 provides for protection or restoration of public shorelines, including periodic sand replenishment at a 65 percent federal cost share up to $3 million per project.

Storm Damage Attributable to Federal Navigation Works
Section 111 of the Rivers and Harbors Act of 1968 provides for the prevention or mitigation of erosion damage along the coastline of the United States when the damage is a result of a federal navigation project. CAP-authorized projects are only intended to reduce erosion to

THE CONTINUING AUTHORITIES PROGRAM (CONTINUED)

the level that would have existed without the construction of the federal project. Project cost is limited to no more than $2 million and has no non-federal cost share requirement.

Project Modifications for Improvement of the Environment
Section 1135 of the Water Resources Development Act of 1986 provides for a federal contribution of 75 percent up to $5 million of the cost of modifying the structures and operations of Corps of Engineers water resources projects to improve environmental quality and with an emphasis on projects benefiting fish and wildlife.

Beneficial Uses of Dredged Material
Section 204 of the Water Resources Development Act of 1992 provides for the use of dredged material from federal projects to protect, restore, or create aquatic habitats, including wetlands. The federal government will pay up to 75 percent of the incremental cost above the least cost method of disposing of the dredged material.

Aquatic Ecosystem Restoration
Section 206 of the Water Resources Development Act of 1996 authorizes projects that will improve the quality of the environment, are in the public interest, and are cost-effective. The 65 percent federal share may not exceed $5 million, including studies, plans and specifications, and construction.

County, for example, where the Saw Mill River is the dominant drainage basin, the population grew by more than 50 percent in the half century after 1950, while the city of Yonkers' share of the county population declined. At least as much as the weather it was the post-World War II suburban boom that drew the New York District into the business of limiting the risk to life and property from flooding.

In 1968 a drought in the region ended with a series of heavy rainy seasons that produced widespread flooding. Parts of New Jersey were declared federal disaster areas in several successive years. This led the New York District to look carefully at flood control needs in the region. District personnel active in those years recall witnessing widespread destruction of property and the human suffering these floods caused. They speak of being highly motivated by the devastation they saw, resolving to help build projects that would protect families from floods. The elected representatives in both houses of Congress were similarly motivated, with the result that a lot of flood-related work came to the district in the 1970s and 1980s. The groundbreaking Water Resources Development Act of 1986 (WRDA86) authorized roughly $12 billion in federal spending on 377 water-related studies and construction projects. WRDA86 authorized more than thirty New York District projects including the construction of nine district flood control projects, several of which stemmed from the official concern that had built up in the late 1960s and early 1970s, although some key projects had been authorized even earlier.

The New York District's flood control work can be arranged into five categories. One, the biggest by far, consists of the two basin-wide efforts in the Passaic River and Green Brook watersheds. Another consists of a group of five smaller Saw Mill River basin projects that, though all in one watershed, were not planned together. A third class of project consists of another group of smaller undertakings, each costing less than $25 million to construct, which could be authorized by Congressional Committee without specific legislative action. This group has included flood control efforts on the Elizabeth and Rahway rivers in central New Jersey and in North Ellenville in New York's Catskill Mountains. A fourth type of flood control work involves dam safety. WRDA86 created a Dam Safety Assurance Program that encompassed the planning, design, construction, operation, maintenance, evaluation, and oversight of dams designed, built, owned, or operated by the Corps of Engineers. The fifth category comprises small flood control projects costing less than $5 million, which come under the Continuing Authority Program and, until recently, did not require additional Congressional authority.

The New York District's web site in early 2006 referenced some thirty flood control projects in New Jersey, sixteen in New York, and one in Vermont. It is impractical to discuss each of these individually. Instead this chapter features those projects that highlight representative issues faced by the district in flood control work – both with basin-wide projects and for smaller projects in individual municipalities.

It is no accident that so much flood damage reduction work has been located in New Jersey. Northern New Jersey is home to a dense network of rivers, creeks, and streams. At an early stage of New Jersey history they enabled exploration and settlement. But the Industrial Revolution took hold as population grew, and more people made New Jersey their place of work and residence. Building spread into floodplains and wetlands where previously excess water drained. In 1978 a New Jersey County and Municipal Government Study Commission report estimated that it would cost $2 billion to fix the state's flood problems, which, if the Corps were authorized to build these projects, would be subject to cost-sharing agreements and allocation of funding. One cannot fault the Commission's assessment that "until flood protection projects are built, where warranted, life and property will continue to be under constant threat, and the only uncertainty in many of the state's flood prone municipalities is when the next flood will occur." This verdict remains essentially true today more than a quarter of a century later – not only in New Jersey, but elsewhere within the New York District's civil works boundaries as well.

PASSAIC RIVER BASIN

The Passaic River winds for roughly eighty-five miles through northern New Jersey. It begins as a stream in Mendham Township in Morris County. From Mendham it runs steeply downhill to the south-southeast until it reaches the edge of the Great Swamp; at Millington it drops through a small gorge before it turns northeastward. Flowing gently again, its channel intermittently narrows or broadens as it passes through extensive wetlands and marshes. At Lincoln Park the river turns east for a few miles before it turns northeast and drops suddenly through the ravine at Little Falls, thereafter resuming its


Passaic River Basin
Orange
Sussex
Passaic
Rockland
Bergen
Morris
Essex
Hudson
Union
Somerset
Middlesex
Bronx
Manhattan
Brooklyn
Staten Island
New York
New Jersey
Hudson River
Wanaque R.
Pequannock River
Ramapo River
Saddle River
Rockaway River
Whippany River
Passaic River
Mountain
Watchung
First
Great Swamp
Paterson
Passaic
Hackensack
Morristown
Newark
Jersey City
Elizabeth
Bayonne
Lower New York Bay
0
5 miles
N

lazy northeasterly journey. At Paterson the river drops again: almost seventy feet down the Great Falls of the Passaic. (East of the Mississippi, these are second in height only to the Niagara Falls.) After a few more miles heading north and then northeast the Passaic suddenly reverses direction, winding southward for twenty-five miles before reaching Newark Bay.

The Passaic watershed drains an area of 935 square miles. It is a vast, roughly oval basin that contains the Passaic itself and a network of other rivers and streams, which together incorporate almost 1,000 miles of running water. The three principal tributaries are the Rockaway River, into which the Whippany River flows; the Pompton River, which has three significant sources, the Ramapo, Wanaque and Pequannock rivers; and the Saddle River, which joins the Passaic downstream and is itself fed by many small streams. Roughly 85 percent of the Passaic River basin lies in New Jersey, touching 117 municipalities, portions of eight counties, and covering just over 10 percent of the state. Small parts of Orange and Rockland counties encompassing fifteen municipalities in southeastern New York State are in the basin as well.

The basin can be divided into three regions: a rural highland area of thin soil and steep slopes where most of the tributaries form; the suburban central basin, which includes large wetland remnants of Glacial Lake Passaic, and through which the Passaic flows gently; and the largely industrial lower valley, where the river streams toward Newark Bay. The Pompton River and its three tributaries rise in the highlands. When the Pompton River joins the Passaic at Two Bridges in Wayne Township it traverses a shallow gorge through the Second Watchung Mountain to Little Falls. This is a critical trouble spot in the drainage system. Nearly 80 percent of the flow within the basin must pass through this narrow ravine before coursing on to the Great Falls of the Passaic at Paterson. When rain and snowmelt swell the rivers, the volume of water becomes too great for this constricted channel and the Passaic actually backs up into the central basin's wetlands. Moreover, when the amount of water passing through the Little Falls gap becomes more than the Passaic can hold, the section of the valley between the First and Second Watchung ridges also floods downstream of the gorge. The lower valley floods too, though less often. Flooding in the lower valley tends to take the form of flash floods along the many small tributaries of the Saddle River or tidal inundations (the Passaic is tidal as far upstream as the Dundee Dam just south of Paterson).

The basin, where roughly 2.75 million people now live, has averaged a serious flood roughly every six years for the last two centuries. Lying in the path of frequent heavy rains and snows, flooding in the basin over the past forty years has warranted federal disaster designations in 1968, 1971, 1972, 1973, 1975 (twice), 1984, 1987, 1992, 1999, and 2005. With the floodplain accounting for roughly 20 percent of the basin's surface area and hosting approximately 50,000 residences and places of business, the average annual cost of flood damage exceeded $100 million in 2004, according to district estimates. According to the district's "*Passaic River Mainstem and Tributaries, New Jersey: Flood Damage Reduction and Restoration Projects*" fact sheet, total losses between 1900 and 2004 were estimated in October 2004 dollars at over $4.5 billion.

The Corps of Engineers involvement in the Passaic River basin began when the Flood Control Act of 1936 recognized that the federal interest should address "improvements of rivers and other waterways, including watersheds thereof, for flood control purposes." Since then, the district has issued eight flood control plans – in 1939, 1948, 1962, 1969, 1972, 1973, 1987, and 1995 – none of which has achieved local consensus, although some pieces of the most recent plan have been built. The main reason for a lack of consensus is one the region still faces: the interests of upstream property owners fail to coincide with those of downstream dwellers. Voters in municipalities upstream were reluctant to devote valuable real estate to projects that would primarily benefit those who lived downriver. The district faced another problem because successive New Jersey governors differed over whether flood control projects should also address water supply issues.

In the 1960s yet another situation arose that made consensus even more difficult to achieve. A broad sense was developing among people in those years that unfettered growth was encroaching on wetlands, depleting forests, and generally chipping away at natural open spaces. When the Port Authority proposed building a jetport in Morris County a general concern narrowed to a quite specific local threat, and a group of residents organized to fight the project. Not only did they defeat the airport plan, they also protected the area by creating the Great Swamp National Wildlife Refuge in the southwestern corner of the Passaic River basin. Many veterans of the jetport fight later became opponents of district structural flood control proposals for the basin. But they were not the only environmentalists active in the basin.

The Passaic River Coalition was organized in 1969 to challenge the district's ambitious multipurpose plan for flood control, hydropower, and pollution abatement, which included a reservoir formed by extensive levees and dikes, a conservation pool, stream diversions, and floodwalls. As the Coalition grew into a champion of the entire basin it continued to fight the district on most aspects of its proposals for specific flood protection projects. It continues to support the government's buying of property in the floodplain, however, and in 2006 its website included a link to the district's Floodway Buyout Plan fact sheet.

In April 1973 the New York District finished its third flood control plan for the Passaic River basin in four years. At a public hearing in Pompton Lakes it presented a modification, a reduction in scale actually, of the 1972 multiuse plan (which was itself a modification of the 1969 plan) that had been rejected by the Board of Engineers for Rivers and Harbors. The Board, which under the direction of the Commanding General of the Corps of Engineers reviews all proposed water resource projects for water quality, economic justification, compliance with legal and technical standards, local cooperation agreements and other standards, in effect, told the district that flood control needed to be its overriding consideration. The 1973 plan had as its primary component a dry detention reservoir for flood control formed by a series of levees near the confluence of the Pompton and Passaic rivers at Two Bridges. Secondary elements included: recreational improvements; channel modifications, including diversions, along the Passaic, Pompton, Pequannock, Wanaque, and Ramapo rivers; and six independent, local protection elements. The 1973 plan received more support than the 1972 plan, but serious differences remained between those who lived or worked in flood-prone areas and those less directly affected.

There were three main points of controversy: 1). upstream interests objected to the loss of properties that would generate tax revenue and the expenses their municipalities would incur for downstream beneficiaries; 2). single-purpose advocates of flood control questioned the high cost and scale of an ambitious multipurpose project; and 3). environmental opponents of structural solutions like the Passaic River Coalition focused mostly on the negative environmental impacts of the levees, the reservoir, and the proposed channel modifications. In proposing non-structural alternatives, the Coalition aimed to transform the use of the floodplain, hoping to remove most of its occupants by buying properties, relocating buildings, and raising and flood proofing those that remained. Legislation that mandated zoning restrictions and other land use controls completed their picture. Underlying this triangular dispute, however, there was a broad consensus on the need to control flooding in the Passaic River basin. In 1974 Governor Brendan Byrne approved the district's plan in substance, though he suggested a number of revisions to it in deference to the objections of the Passaic River Coalition and other environmentalists. He also proposed, the Board of Engineers for Rivers and Harbors notwithstanding, that the district consider restoring water supply to its plan.

During the summer of 1975 the basin flooded twice, which spurred renewed calls for action. Quoted in the *New York Times* David J. Bardin, Commissioner of New Jersey's Department of Environmental Protection, referred to a "sword of Damocles hanging over" the basin every time it rained because, in his opinion, people had been sold houses in places where they should never have been built. (The population of Wayne Township, for example, grew by almost 60 percent between 1960 and 1970; building in the Passaic River floodplain contributed significantly to this expansion.) Around this time the idea of a floodwater diversion tunnel that would act like a giant storm drain reappeared. Although such a plan had been rejected in 1948 as too expensive, some still saw the tunnel as a reasonable middle ground between the extensive surface impact of reservoirs and rerouted river beds on the one hand and the extreme non-structural approach of the environmentalists on the other.

Flood control proponents who differed on solutions united to advocate further study of the problem during Congressional hearings on the Water Resources Development Act of 1976 (WRDA76). Meanwhile, the Board of Engineers for Rivers and Harbors again told the New York District to eliminate all considerations except flood control. But just as the occupants of governors' chairs change, so also do the composition and attitude of Congress. The 94th Congress specifically authorized $12 million for a reevaluation of all flood control options in the Passaic River basin in WRDA76. A report from the House Committee on Public Works and Transportation that accompanied the bill provides a good picture of the situation in the basin in 1976:

> Controversy … emanates from many communities in Morris and Essex Counties that stand to lose substantial portions of their land to structural solutions; from conservation interests who seek non-structural solutions; from those who reject dams, dikes, and levees in their communities; from those who believe other forms of construction such as a diversion tunnel or a system of tunnels addressing the needs of the entire basin should be reevaluated; from those who believe water supply objectives should be met together with flood control.

Congress directed the district to reformulate "the plan for water management and flood control," ruling out alternatives that made "extensive use of dikes, dams, and levees" in favor of non-structural approaches such as land acquisition, floodplain mapping, flood proofing, early warning systems, and relocations, as well as a tunnel or tunnels "addressing the needs of the entire basin." The legislative mandate also included consideration of separable interim projects in hydraulically separable areas that could be pursued independently, rather than making their implementation contingent on adoption of an overall plan. Interims, by definition, partially meet a problem in one of two ways: either they provide a partial or temporary solution to the overall problem, in this case mainstream floods; or they offer a solution of some kind, partial, temporary or total, to a part of the problem.

Recognizing the significance of the Passaic River basin project, the district established a separate branch to handle it. When funds for reformulating the water management and flood control plan arrived in 1978, the Passaic River Branch surveyed the entire floodplain and created a computer model of its hydrology and hydraulics. The team focused their activity on two fronts: the Main Stem Passaic River flood problem; and possible interim flood protection measures. This approach provided a comprehensive look at the entire watershed. The district first went to work on a main stem reconnaissance study. Corps of Engineers reconnaissance studies are intended to determine if a plan that meets federal standards is locally acceptable so planning may proceed to the next (feasibility) phase. However, when the district presented the results of its reconnaissance study to the public in

1979 it received a cool reception for the same reasons the earlier plan had been rejected, and returned again to the drawing board.

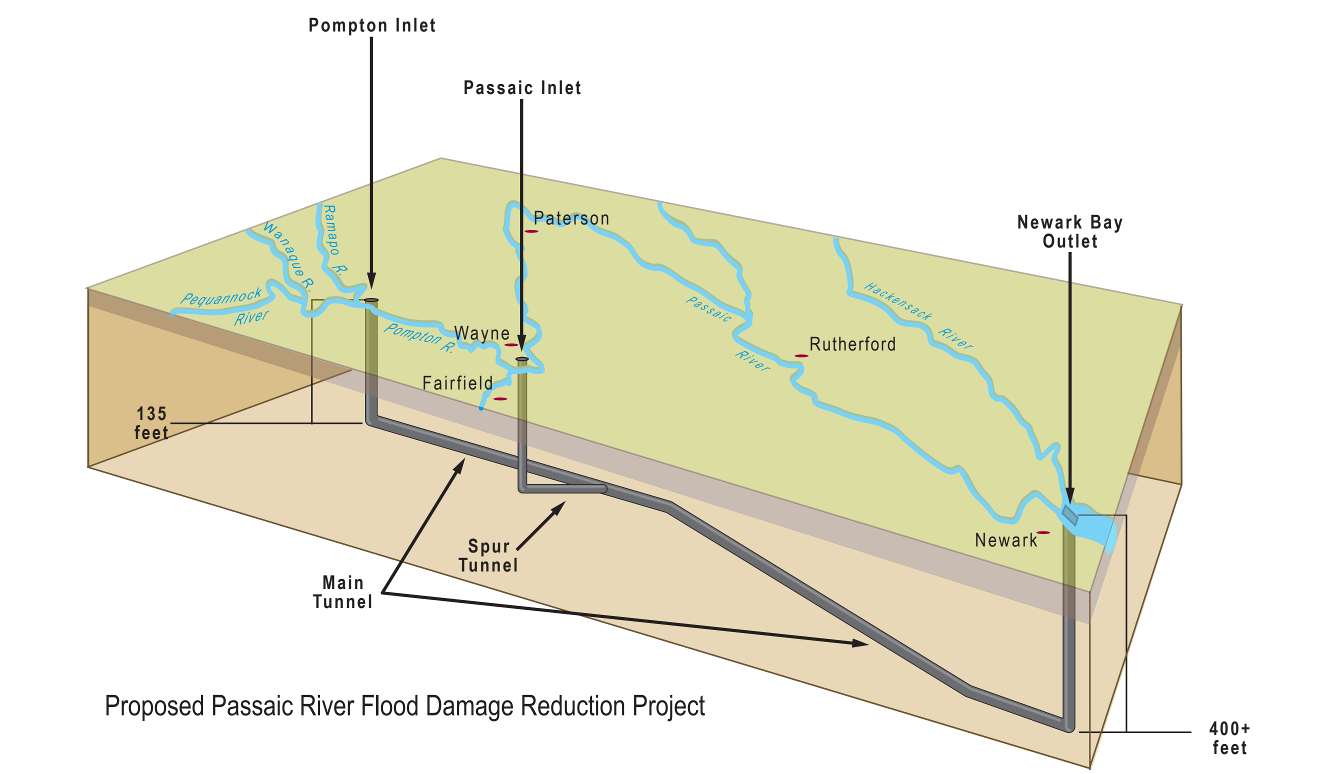
In 1980 the Passaic River Branch, which had started out in the Engineering Division, was moved to the district's new Planning Division, and in 1983 it released an intermediate stage report, which was an effort to address some of the concerns that had been raised about the reconnaissance study. This report identified a number of interim projects that could be built before work began on an overall basin-wide flood damage protection effort. The states of New York and New Jersey each recommended some interim project areas, which the branch analyzed. This led to several more reports. A number of the locations were not found to be in the federal interest because their high costs outweighed the value of the benefits they would provide. Among those locations that met federal criteria, however, were the Saddle River sub-basin, Molly Ann's Brook, the Ramapo and Mahwah rivers at Mahwah, and the Ramapo River at Oakland. New Jersey also suggested looking at three basin-wide interims: a regionalized flood warning system; acquisition of some natural flood storage areas; and clearing, snagging and/or dredging actions in certain channels.

The district faced two challenges in this work. One involved New Jersey Representative Robert Roe, who was from Wayne and had taken a great interest in the Passaic River basin. Roe believed strongly that all water-related problems were connected and required an integrated solution. The Congressional authorization for a multipurpose study in 1976 reflected his approach. To those who had been working on finding consensus on flood control issues in the basin, it was clear that finding local support for a sole-purpose flood control plan would be difficult enough – indeed, the *New York Times* in early 1977 called it a "losing battle." Aware that local support would be nearly impossible to find for large-scale reservoir construction, district personnel recall that they did not focus on that option, but instead concentrated most of their energies on the rest of what the authorization was intended to cover.

The other problem was similarly political. New Jersey did not have an entity that was legally empowered to be the non-federal sponsor. The state appointed a Deputy Commissioner in the Department of Environmental Protection, former Assemblywoman Betty Wilson, whose sole portfolio was the Passaic River basin flood problem, but legislation, which the state legislature passed in the early 1980s, was necessary to empower the state to co-sponsor the project.

In April 1984 two days of rain combined with melt from a twelve-inch, late-spring snowfall to bring about a devastating flood. Nineteen municipalities in four counties flooded: along the Passaic River from Elmwood Park to Chatham, and along the Pompton, Pequannock, Ramapo, Wanaque, and Saddle rivers. There were three fatalities and 9,400 evacuations. Major highways were impassable for days and electricity was out in some areas for three weeks. It was easily the worst flood in forty-five years. Towns were hit that had never known high water. An estimated $462 million worth of damage (almost twice as much in 2005 dollars) was done to 6,400 residences and businesses. Some long-time residents described this flooding as the worst in memory, which they attributed to the number of new homes, shopping centers, and industrial parks that had been erected in recent decades in place of swamps and fields. There were, in fact, areas in the basin where the population had doubled between 1960 and 1980.

In May 1984 the district unveiled plans for a forty-foot-diameter diversion tunnel, with three possible routes, as its basin-wide solution. District engineer Colonel F.H. "Bud" Griffis was optimistic that this plan might succeed because the state of New Jersey under the administration of Governor Thomas Kean had agreed to be the project's non-federal sponsor. In June 1984 after a series of hearings, the New Jersey Department of Environmental Protection selected a dual-inlet tunnel. The adopted plan also included some channel modifications, more stringent controls on development, purchase of land for natural storage areas, and a flood warning system, as well as levees and floodwalls in the lower Passaic Valley, central basin, and along the Pompton River tributaries. With an approximate price tag of $930 million (adjusted to roughly $840 million in 1987), it was the most environmentally



Proposed Passaic River Flood Damage Reduction Project sensitive plan the district had ever designed. It would acquire several thousand acres of natural flood storage areas and wildlife habitat, create natural corridors between wetlands to ensure genetic diversity among wildlife populations, and would mitigate adverse effects on natural and cultural resources.

Within days the *New York Times* described "seeds of disunity among basin towns." State Assemblyman Stephen N. Adubato, who represented Nutley, said, "I don't want to be an obstructionist," but "give the towns in the lower Passaic more time." In August, a hearing Assemblyman Adubato held in his capacity as chairman of the Assembly Passaic River Restoration Subcommittee drew 150 people. *The Record* described it as a "storm" over the flood tunnel plan. The Passaic River Coalition opposed the plan on environmental grounds, favoring a massive buyout.

In June 1986 a consultant to the New Jersey Department of Environmental Protection concluded that the only realistic way the project could be built was if the state were to pay its share of the costs, which he estimated at roughly $260 million, plus $5 million every decade in major maintenance costs. He further urged that municipalities along the Pompton and Passaic rivers pay the estimated $2.7 million annual operating and maintenance cost, which he estimated would be only $12.30 in additional taxes on each $100,000 home in the basin. This part of the recommendation was not so popular, even in the major beneficiary areas such as Wayne, Pequannock, Lincoln Park, and Fairfield. The Township Manager in Pequannock, for example, objected to the local cost share for operation and maintenance. In his view all of the municipalities in the basin contributed to the water in the rivers and all should pay.

The district released the "*Main Report and Environmental Impact Statement, Passaic River Main Stem Flood Protection Feasibility Study*" in December 1987. This was a massive accomplishment representing ten years of work. The combined documents comprised 3,000 pages. The recommended plan included some important changes from the first design. The main feature of the plan was a thirty-nine-foot-diameter, 13.5-mile-long main tunnel with a flow capacity of 28,200 cubic feet of water per second whose main purpose was to get floodwaters past the Little Falls gorge. It would go from the upper Pompton River just below its confluence with the Pequannock, Wanaque, and Ramapo rivers to an outlet in the Passaic River at the Clifton-Nutley border. A 1.3-mile-long spur, twenty-two feet in diameter, would have an intake in Wayne a few hundred feet upstream from the Interstate Route 80 bridge, rather than near Beatties Dam in Little Falls. It would connect to the main tunnel about eight miles upstream of the outlet.

The revised design was based on the computer modeling of the river system, which enabled the planners to see they needed a tunnel system that handled two separate peak flows. During a flood the Pompton River typically peaks almost two days before the Passaic River. When the Pompton River crested the small tunnel would be closed so the main tunnel could accommodate the Pompton's full flood flow. When the Passaic crested the small intake would be open but the Pompton's peak would have passed and the main tunnel would have ample capacity for the spur's flow. The tunnel would reach varying depths along its route. The intakes would be 90 and 125 feet deep respectively. At its deepest, under the Watchung Mountains, the tunnel would be 450 feet below the ground surface. The tunnel would reach the Passaic at its outlet at a depth of 155 feet from which pressure would force the water up and into the river. The dual-inlet diversion tunnel would be augmented by nearly six miles of channel modifications and thirty-plus miles of levees and floodwalls. While some river views and access would be impeded by levees and floodwalls, the purchase of roughly eight square miles of land, most of it in Morris County, for natural floodwater storage would provide a large greenbelt of land. This plan would protect all three major flood-prone areas: the Pompton River valley; the central basin; and the lower Passaic River.

Roughly a year after the plan was released it was endorsed by the Board of Engineers for Rivers and Harbors. It received the approval of the Chief of Engineers in February 1989. The Assistant Secretary of the Army (Civil Works) transmitted the report to the Office of Management and Budget for review in October 1989.

However, the support the plan received inside the government water resources bureaucracy was not matched locally. Flood-prone communities supported the plan for the most part, and residents in towns that would have been affected by the reservoirs planned in the early 1970s dropped their opposition to structural solutions, but municipalities in southern Bergen County became opponents. They feared that the tunnel was taking problems from the central basin and relocating them to their area. Representative Robert Torricelli promptly proposed extending the tunnel into Newark Bay, where its discharge could be more easily absorbed. The district noted that this would add roughly $300 million to the cost already estimated at $847 million and make its support in Congress less certain.

In the meantime, a notable interim project was completed in March 1988. The New York District had studied the basin's Flood Emergency Preparedness System and recommended enhancements. The result was a massive warning system known as IFLOWS for "integrated flood observing and warning system." Designed to give at least four hours advance flood warning, the system used a network of thirty-one electronic sensors scattered throughout the basin and linked by satellite. At a cost of roughly $1.5 million, this system was expected to reduce property damage by 10 percent annually, or an estimated $8.4 million. When it was first implemented IFLOWS was managed by the New Jersey Department of Environmental Protection, but a few years later the Corps gave the system over to the National Weather Service, which was still operating and maintaining it in late 2006.

In September 1988 environmental groups proposed a $400-million alternative to the Corps of Engineers basin-wide flood control plan consisting of a voluntary buyout and flood proofing of central basin residential properties in the floodway (and subsequently of properties in the ten-year floodplain). They also proposed the creation of a state agency to administer the relocation efforts as well as environmental restoration of the purchased properties. Attractive to many in theory, this plan was not a viable alternative to most observers. It was not politically practical, its cost estimates were far too low, and it left the majority of the flood-prone properties at continued risk. Impractical though it may have been, the buyout was given a boost in the arm by water resources development bills in 1990 and 1992, which gave the state credit towards its non-federal share of the project's costs for any complementary or supplementary flood control work done in the basin.

Eventually Representative Robert Roe joined Representative Torricelli in supporting an extension of the flood diversion tunnel into Newark Bay. The city of Newark came out in favor of this extension as well. The difficulty was money. The district had concluded that the shorter tunnel was the more cost-effective plan, so additional costs would have to be borne by New Jersey.

In November 1990 Congress approved the Water Resources Development Act of 1990 (WRDA90), a $2.7-billion package authorizing twenty-six water resource development measures. Its single largest element, representing more than 40 percent of the entire authorization, was the $1.2-billion Passaic River Main Stem Flood Protection Project with estimated first costs of $890 million federal and $310 million non-federal. The legislation authorized the project the district designed, and which the Chief of Engineers approved in February 1989, "except that the main diversion tunnel shall be extended to include the outlet to Newark Bay." This meant that there were no structural features to the project in Bergen County. It also meant that a supplemental environmental impact statement would be required because of the design changes. The district moved its thirty-person Passaic River team (now a separate division) to Hoboken where this report, as well as the engineering and design the legislation funded, were carried forward.

The problem of costs to New Jersey remained, but WRDA90 included a pair of provisions designed to appeal to local interests. The overall Passaic River project included $6 million for streambank restoration on the west side of the Passaic River in Newark. The addition of this project, which was to be undertaken independently of the main project, helped gain the support for the tunnel from Newark Mayor Sharpe James and other Essex County leaders. When completed, the streambank restoration project would stabilize the eroded waterfront and turn the formerly industrial area into walkways that could be used by visitors to the New Jersey Performing Arts Center. Secondly, the legislation created a wetlands bank. The value of any lands contributed to this bank could be credited against the 25 percent non-federal share for flood damage reduction projects in the Passaic River basin. The Water Resources Development Act of 1992 (WRDA92), which modified the tunnel project in a number of ways, increased to $25 million the authorization for the streambank restoration and named the area the Joseph G. Minish Passaic River Waterfront Park and Historic Area to honor the former Democratic Congressman who represented the local community in Washington from 1963 to 1985.

Meanwhile the debate on the tunnel continued. On some levels it pitted Congress in Washington against the New Jersey state legislature in Trenton. Led by Representative Roe, the entire New Jersey congressional delegation, including senators Bill Bradley and Frank Lautenberg, supported the plan, but state legislators were not so sure. They questioned whether the state could afford its share of the costs, and seemed to be influenced by the Passaic basin environmental groups who ran an aggressive campaign arguing that the tunnel would destroy wetlands and deplete the groundwater supply. The legislation created the wetlands bank, but environmentalists questioned its efficacy. The biggest argument, however, was over costs. WRDA92 suggested the non-federal cost would be $310 million. Representative Roe pointed out that with credits for the wetlands bank and other watershed lands, the cost to New Jersey would come down to roughly $150 million.

Engineering and design work continued while the debate raged. In March 1991 Representatives Dean Gallo and Bernard Dwyer joined the Energy and Water Subcommittee of the House Appropriations Committee, giving New Jersey two of the nine seats and making it more likely that construction funds for the tunnel would be included

Passaic River streambank restoration in progress in Newark, New Jersey, circa 1998 in the upcoming federal budget. But in 1992 the Passaic River basin project design and engineering budget was reduced from $7 million to $3 million, suggesting that the ongoing debate in New Jersey was leading to questions about whether the state would ever commit to sponsoring the project.

When Christine Todd Whitman faced Governor James Florio in the 1993 gubernatorial contest she opposed the project, while Florio had equivocated on the issue his whole term. When Whitman was elected, the *Engineering News-Record*, ordinarily a supporter of infrastructure projects, called for shelving the tunnel. Its objection was more than merely pragmatic. The editorial wondered "why the federal government must come to the rescue of everyone who chooses to live in or conduct business in a flood plain."

Governor Whitman endorsed a buyout and in February 1994 she asked the district to undertake a systematic study of the costs. The district did a careful survey of buying out properties that would be damaged by ten, twenty-five, fifty, and one hundred-year floods, which it released as the *Draft Passaic River Buyout Study* in September 1995. The study confirmed earlier suspicions about the unrealistically low cost projections used by proponents of a buyout plan. It found that none of the buyout programs met federal cost-benefit standards. The ten-year floodplain buyout would cost $1.6 billion over fifteen years, the twenty-five-year buyout $2.3 billion, the fifty-year buyout $2.8 billion, and the one-hundred-year buyout $3.9 billion (using October 1994 price levels). The district supplemented this in October 1995 with the *Draft Passaic River Floodway Buyout Study*. A floodway – the core channel of the river which, if blocked, will increase the depth of floodwaters – is narrower than a floodplain so fewer structures in fewer municipalities are involved than in a full-scale floodplain buyout. A central basin floodway buyout, the district found, would involve approximately 800 homes in nine municipalities with a total first cost of more than $158 million, but even this more modest plan did not meet the cost-benefit standard for a finding of federal interest.

In 1997 a national coalition of environmental, taxpayer, and public interest organizations called the Green Scissors Coalition targeted for elimination from the federal budget a list of forty-seven "polluter pork" projects. The Coalition singled out the Passaic River tunnel plan, calling it "unnecessary and expensive." No one denied the Passaic River Flood Protection Dual Inlet Tunnel Project was expensive, but its necessity was a matter of debate. In 1999, for example, floodwaters from Hurricane Floyd caused approximately $200 million in damages in the basin, which the tunnel might have prevented.

Still lacking a non-federal sponsor, the tunnel project was shelved. The Water Resources and Development Act of 2000 cut off funding for "the tunnel element of the Passaic River flood control project." But this did not represent total defeat for efforts to control flooding in the Passaic River basin. In late 2006, three elements of the original

Main Stem project were in varying stages of completion: the Joseph G. Minish Waterfront Park and Historic Area (discussed above); the Harrison Levee/Floodwall Project; and the Preservation of Natural Flood Storage Areas.

The Harrison Levee/Floodwall Project involves the construction of 7,450 linear feet of levee and floodwall on the east bank of the Passaic River in the Town of Harrison. The system is designed to protect residential, commercial, and industrial structures from tidal floods. After a hiatus owing to lack of local sponsor support the project team has recently resumed engineering and design including the preparation of a Limited Reevaluation Report (LRR) to reaffirm the viability of the existing project. In contrast to the Harrison project, the Preservation of Natural Flood Storage Areas aims to prevent flood damage from worsening as opposed to reducing flooding through structural intervention. This project includes the acquisition of approximately 5,350 acres of natural storage areas, virtually all of which are wetlands. Since another 15,800 acres of the central basin are, or will be under preservation through various means, more than thirty-three square miles would be in permanent protection as a natural flood storage area for this effort.

New Jersey has also supported a number of other New York District flood control projects in the Passaic River basin. Molly Ann's Brook, a 2.5-mile-long modification of a stream that runs through Haledon, Prospect Park, and Paterson, is being managed by the Philadelphia District because the New York District was so busy in the late 1980s with Fort Drum and other projects that the North Atlantic Division encouraged the district to share some of its work. The Molly Ann's Brook construction was all but completed several years ago, but finishing funds were unavailable. These were included in the fiscal 2006 budget. The two elements of the project to alleviate flooding of the Ramapo River at Oakland were completed. The Ramapo was widened and deepened, and a nearly eight-acre wetland in Potash Lake was created as mitigation for environmental impacts. Flood control gates at the Pompton Lake Dam were also constructed. In addition to the above projects there are fourteen other flood control or flood damage reduction projects in the Passaic River basin that are at an early stage in the planning process, i.e., the subject of reconnaissance studies, planning or feasibility studies, design efforts, or continuing authority projects.

In August 2005 the New York District published a limited update to its floodway buyout study of 1985, focusing on thirty homes in Wayne and Pompton Lakes. Although the district has so far found no federal interest in a buyout program, New Jersey spent $15 million buying property from willing sellers through its Blue Acres Program in the late 1990s. Congress would have to appropriate funds for the Corps to begin implementing buyouts in the future. Just how many homes will ultimately be purchased will depend on future Congressional decisions.

No one can foresee the future, but some in the district think it is possible that what seemed in the late 1990s like the tunnel's demise will turn out to have been only its hibernation. Quiet conversation about the plan never ended in the basin, and following floods in the spring and fall of 2005, elected officials from affected municipalities revived the idea. District personnel suggest that if historical weather patterns persist, the region will spend a few billion dollars on flood-related expenses in the next decades, even if nothing new is built. Should public opinion swing toward the tunnel the district will do the necessary reassessment of the project.

GREEN BROOK SUB-BASIN

Covering 1,100 square miles in north-central New Jersey, the Raritan River basin is the largest watershed wholly in New Jersey. It includes parts of seven counties and all or part of one hundred municipalities. The Green Brook sub-basin is one of sixteen that compose the Raritan basin. It forms a bell-shaped area of sixty-five square miles that includes thirteen municipalities – four in Middlesex County, six in Somerset, and three in Union. The population of the Green Brook sub-basin, which in 2000 was over 275,000, has grown by more than 50 percent over the past forty years.

The Green Brook watershed collects runoff from the steep slopes of the First and Second Watchung Mountains, and meets the Blue Brook before it tumbles through a diagonal gorge in the First Watchung Mountain. It then glides to the southwest along the base of the mountain through a broad, densely populated plain for roughly twelve miles before joining the Raritan River just east of the town of Bound Brook. Five sizeable tributaries meet the Green Brook at various points along the way.

Floods occur in the Green Brook sub-basin when local thunderstorms, northeasters, or tropical storms and hurricanes, all of which are common in the area, swell its constituent watercourses beyond their capacity. Sometimes the streams in the plain overflow their banks; at other times the streams already exceed their capacity when they flow out of the mountains. The specifics of each flood vary with the weather that brought it into being.

One indicator of how endemic flooding is in the Green Brook area comes from etymology. The word Raritan is thought by some to derive from an Algonquian word meaning "stream overflows." Written records evidence flooding in the Green Brook sub-basin in the colonial period, but with population sparse these inundations were generally just a minor inconvenience. They became more of a problem as isolated settlements in the floodplain grew into towns and cities, and accounts of serious floods are frequent from the late nineteenth century onward.

When Senator Prescott Bush mobilized the Corps of Engineers to investigate flood control measures on all the rivers and streams that lay in Hurricane Diane's path in 1955, the New York District found no federal interest in structural flood control solutions in the Green Brook sub-basin. Between Diane in October 1955 and the mid-1970s there were major floods in September 1966, May 1968, August 1971, and August 1973, in addition to numerous locally serious flash floods. In 1968 a district reconnaissance survey of small projects along three Green Brook tributaries recommended further study at all three locations. But follow-up feasibility reports found that individual flood protection projects were not economically justifiable. In 1969 a flood in the basin did damage valued at $5 million (roughly $13 million in 2005 dollars). A concerted local effort to address the problem of flooding in the Green Brook sub-basin dates from that storm. In 1971 basin residents won passage of state legislation that enabled New Jersey communities with flood problems in common to form regional flood control commissions. The Green Brook Flood Control Commission drew representatives from each county and town in the sub-basin soon after passage of the enabling law.

Tropical storm Doria, which dropped eleven inches of rain on the area in August 1971, caused flooding that did millions of dollars worth of damage locally. Following Doria, New Jersey's senators in Washington, Harrison Williams, a Plainfield native, and Clifford Case, secured a resolution from the Senate Public Works Committee calling for a close look at the advisability of flood protection work in the area. The resolution also called for "an evaluation of the potential for ground water recharge for consumptive purposes," but this aspect did not receive a serious analysis.

Before the study got under way, however, a catastrophe struck North Plainfield. In early August 1973 heavy rains swelled the Green Brook beyond its banks as it came out of the mountain sending a wall of water through town. Among the six fatalities were an automobile dealer who was in his showroom when the water hit it and a young man who was swept out of his truck by the torrent. Representatives from the district were in Green Brook before the floodwaters had fully receded, outlining for local leaders the steps involved in getting a major federal flood control project authorized and funded. Strong support from local Congressional representatives got a feasibility study for flood control in the Green Brook sub-basin authorized in November.

In studying the 1973 flood, the district reached an important technical conclusion that drove all subsequent analyses: different sectors within the sub-basin flood for different reasons. Accordingly the team divided the basin into three sub-regions, each of which had its own flood damage profile. The largest of these, the lower basin, lies below the Green Brook-Stony Brook confluence in North Plainfield. It has two principal damage areas. One lies near the confluence of the Green Brook and the Raritan River. The town of Bound Brook, bordered on two sides by these sizeable rivers, can be flooded by either the overflowing Green Brook or by water backing up from the Raritan. The second damage area in the lower basin lies upstream along the Green Brook itself and along the lower reaches of the neighboring Bound and Bonygutt brooks in Green Brook Township and Middlesex and Dunellen boroughs.

The second region, the upper basin, lies along the Green Brook above the Stony Brook confluence. Its worst problems arise when floodwaters in the Green Brook channel flow down from the hills, join Cedar Brook, and sweep across areas of Plainfield and Scotch Plains. The third region lies along the Stony Brook where floodwaters tumbling at high speed down 300 or 400 feet from the First Watchung ridge have a devastating effect, as happened in North Plainfield in the spring of 2006.

The district presented four plans incorporating a variety of structural measures at a public meeting in April 1974. Although a preliminary analysis suggested that non-structural means, such as buyouts, raising or relocating structures, and flood proofing, would provide little protection against a 150-year flood, they had strong local support. Instead of ruling them out, the district therefore presented these as options that might provide lower levels of protection. The structural alternative that received the most support consisted of a detention basin and diversion pipe in the upper basin, a detention basin flume and diversion pipe on Stony Brook, and levees and floodwalls in the lower basin. A proposed dam on Stony Brook drew the most opposition, but concerns were also voiced about the potential sites identified for the upper basin detention reservoirs. Based on the response to its proposals, the district agreed to consider modifications in its recommendation for Stony Brook and alternative locations for the detention reservoir in the upper basin.

As the district team began work on revised plans, the U.S. Geological Survey, whose data the Corps of Engineers uses, revised its stream gauge readings for the most recent storms in the basin. The Geological Survey's corrected figures suggested that there was a potential for much more water than previously estimated to spill over from the Green Brook into Cedar Brook through Plainfield and Scotch Plains. The upshot of this was that much of the previous work on the upper basin required reformulation, and some of the original proposals would no longer work. The higher water volume estimates made it much more difficult for the district to formulate a plan that provided the mandated 150-year protection.

Around this time, in the mid- to late 1970s, the situation in the Green Brook watershed was similar to that in the Passaic River basin. Despite widespread agreement that something needed to be done, all structural measures had at least some local opposition, whether it was community spokesmen who were mostly saying "don't build that thing around here," or environmentalists who didn't want much of anything built anywhere. Meanwhile construction estimates climbed as municipalities went on allowing, in some cases even encouraging, residential and commercial construction in their floodplains. In Scotch Plains, for example, residents complained in 1975 that flooding on Mountain Avenue had worsened in recent years because the Blue Star Shopping Center, the first of its kind in the area, had been built on riparian land where overflow from the Green Brook formerly percolated into the water table.

In 1978 the New Jersey County and Municipal Government Study Commission issued its report criticizing the state's flood control efforts. Unlike many commentators, this report did not blame the federal government. Rather, it highlighted the "negative connotation to many people" of Corps of Engineers construction projects and estimated that the Corps had spent $43 million on studies of flood control problems in New Jersey between 1965 and 1975 with no result. (This figure included Philadelphia District studies related to the Tocks Island Dam project on the Delaware River, which took up most of the money, as well as New York District studies in the Passaic River and Green Brook basins.) The report identified two principal forms of opposition to construction for flood damage protection that would need to be overcome if almost certain death and destruction from future floods were to be avoided: "residents of municipalities which would be disrupted or lose ratables," and "citizen" environmentalists. At the same time Betty Wilson, the Deputy Commissioner of the New Jersey Department of Environmental Protection (NJDEP) attributed the failure to implement Corps of Engineers-designed flood control measures to the agency's heavy reliance on large dams that inundated inhabited areas and caused severe dislocations of residents and businesses. The higher water volume estimates made it much more difficult for the district to formulate a plan that provided the mandated 150-year protection.

The district's plan for Green Brook did not involve inundation of any inhabited areas. It included two dry detention reservoirs on undeveloped property upstream retained by dams in Berkeley Heights and the Watchung Reservation, and levees and floodwalls in the lower basin. The reservoirs would hold back floodwaters until they could be released into the Green Brook at a safe volume after the threat of flooding had passed. In the late 1970s supporters of the district plan worried about two problems as its formal unveiling neared. First, they worried that the sense of urgency in finding a solution to the flooding problem in the basin had been replaced by apathy among local residents in the years since the last serious flood in the basin. Second, they were concerned about a turtle small enough to fit in the palm of one's hand.

The bog turtle: a source of controversy for the Green Brook flood control project

It emerged from environmental studies that the habitat of the bog turtle in the Watchung Reservation was threatened by one of the two proposed detention basins. The bog turtle was not on the federal endangered species list, but it was on the list in New Jersey and many other states, and its fate concerned many environmentalists. Members of the Green Brook Flood Control Commission, who had been working toward a flood control project for a decade, were afraid the situation could become similar to a controversy in Tennessee over the fate of a tiny endangered fish called the snail darter. Debate over the snail darter, which was widely publicized because it was one of the first tests of the Endangered Species Act of 1973, had delayed for years completion of a massive Tennessee Valley Authority dam. The Commission viewed the prospect of a similar delay in the Green Brook basin with dismay. "What does the bog turtle contribute to human society?" it asked in a letter to NJDEP Deputy Commissioner Wilson.

Skirmishing over dry detention reservoirs turned out to have been unnecessary, or at least premature, because the district's *Feasibility Report for Flood Control: Green Brook Sub Basin* released in August 1980 ultimately did not recommend building them. By continuing to think in terms of a watershed with three sub-regions, the district had concluded that the plan could address separable elements and did not have to protect all the problem areas at once.

The feasibility study presented a range of plans. Plan A, the most comprehensive, included dams for two dry detention reservoirs, one on the Green Brook and one on the Blue Brook, as well as levees and floodwalls on the Green Brook. It also called for levees and floodwalls on the Raritan River and the Green, Bonygutt, Cedar, Bound, and Middle brooks plus a flume (an artificial channel) on Bonygutt Brook in the lower basin. Along Stony Brook, Plan A utilized levees, floodwalls, and a flume. From a purely engineering standpoint Plan A was best because it dealt with all of the basin's problem areas, but the district recommended what it labeled Plan E because it had the highest ratio of benefits to costs, a requirement of all Corps of Engineers projects. Plan E, which called for the least construction of all the plans, provided protection against a 150-year flood in the hardest hit areas of the lower basin. Residents of the region who lived in flood-prone areas that would not be protected by the levees and floodwall in the economically justified plan howled in protest. They called it half a plan and wondered why things had suddenly changed after all indicators were that a comprehensive plan for the basin would be coming out of the district. Representative Matthew Rinaldo questioned the validity of the entire cost-benefit analysis approach, and Representative Millicent Fenwick introduced legislation to ensure that fatalities were counted as costs.

The Board of Engineers for Rivers and Harbors generally concurred with the district's Plan E. But in March 1981 the Board wrote that a 150-year level of protection was inadequate for a highly developed floodplain such as the Green Brook where catastrophe was not unthinkable. The Board recommended that the project provide protection against a 500-year flood. The Chief of Engineers supported the Board and submitted a project estimate of roughly \$80.3 million (including \$20.3 in non-federal funding, based on a proposed cost-sharing formula for water resources projects then under discussion) to the Assistant Secretary of the Army (Civil Works), William R. Gianelli, in September 1981. However, in the early years of the Reagan administration there was intense pressure to reduce federal spending. When Assistant Secretary Gianelli submitted his recommendation to Congress in February 1984 he returned to the 150-year recommendation because the Board had not, in his opinion, demonstrated that the increased cost of the 500-year project was justified by the greater benefits to be derived from the higher level of protection.

Meanwhile Green Brook residents had been pressing their case. The community wanted the Corps of Engineers to redo its plan, and in 1986 got its wish. WRDA86 included nine projects for "control of destructive floodwaters" in New Jersey with an estimated total cost of \$315 million. By far the largest project was in the Green Brook sub-basin; its \$203-million price tag was nearly twice the sum total of all the others. The legislation specified that the Green Brook project was to "include flood protection for the upper Green Brook Sub-basin and the Stony Brook tributary, as described in plan A" of the feasibility report of 1980.

Soon after the legislation was signed, in November 1986, the district began surveying and mapping the lower basin. The Flood Control Commission kept up its pressure for the basin-wide approach of Plan A, to which the district responded that the lower basin project represented a piece of Plan A. Congress reminded the district of its intent when the Continuing Appropriations Act of 1988 directed the Corps of Engineers to expend pre-construction engineering and design funds on the whole sub-basin. Work on the Green Brook project came to a near standstill as the district tried to reconcile the economically justified plan with the Congressionally and locally preferred plan. The Green Brook Flood Control Commission accused the district of dragging its feet, but in fact local advocates of a basin-wide plan had not really developed consensus for this approach. Not long after WRDA86 was enacted, differences of opinion resurfaced about the location of the proposed dry detention reservoirs in the upper basin.

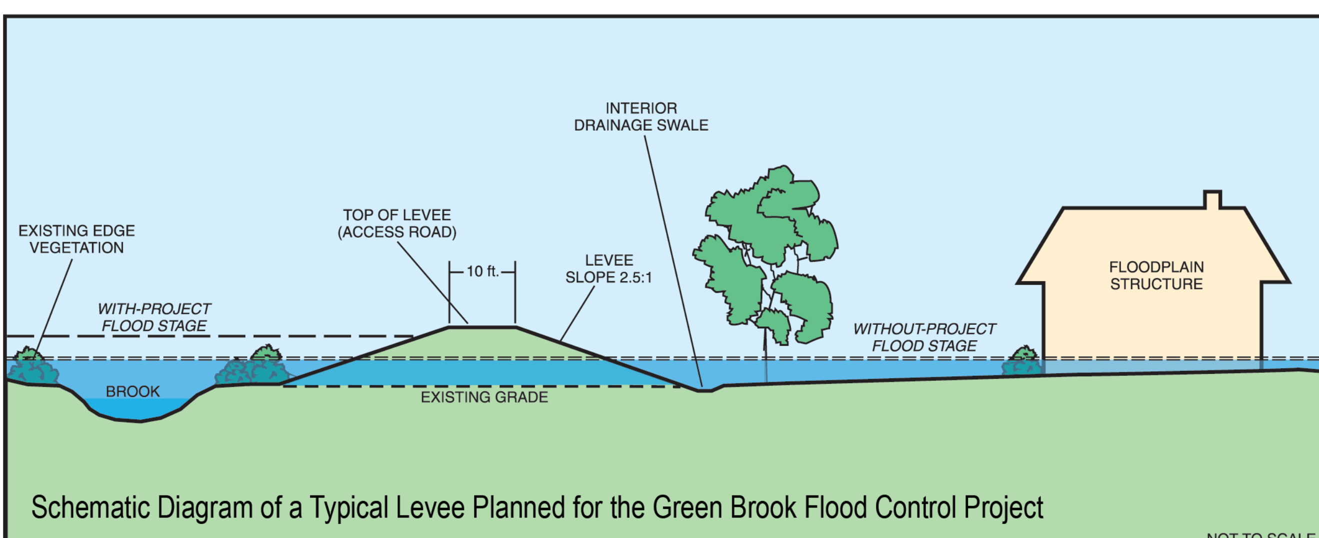
In the mid-1990s the project began to move forward again. In early 1994 the district laid out a two-year plan for a general reevaluation study of the Green Brook sub-basin, which it described as "the most aggressive and complex civil works formulation/engineering effort in the entire New York District." Reflecting the priority the district was placing on the project, as well as its complexity, the Green Brook reevaluation study was the first full implementation in the New York District of the programs and projects management concept. The purpose of the study was to reaffirm the viability of the project elements and reconcile national economic development considerations with local preferences. The team, in effect, dusted off the tripartite division of the basin from 1980, treating each of the areas as a hydraulic system that could be thought of both as part of a linked system and as a separate entity. The study also recognized that the area had changed considerably since the district had looked at it twenty years earlier. Corporate parks, parking lots and shopping centers had been built on formerly vacant land, some even located where project elements had been planned.

During the period when the reevaluation study was under way the district and the Flood Control Commission worked together closely, jointly conducting several tours of flood-prone areas. Gradually a plan emerged that could withstand cost-benefit scrutiny while incorporating all the necessary elements of a basin-wide plan. Given impetus by October 1996 flooding in the basin that caused an estimated $23 million worth of damage, the plan was presented at public hearings in early 1997, by which time the district estimated that since the beginning of the century floods had caused $2.4 billion in damage in the basin.

The new plan was more of a fine tuning of previous proposals than a major redesign – a recalibration of all the hydraulic elements. The district relocated the detention basins slightly, designed smaller dams in the upper basin, reduced the capacity of the modified channels, and lowered floodwall heights. In this way it produced an economically-justified, comprehensive plan of protection that aimed to be acceptable to local interests. But no sooner did the plan's outline emerge at public hearings than opposition surfaced to its upper basin elements. The consensus that had been strong enough to get Congress to mandate a basin-wide approach gave way in the hills. The district's plan located one basin, called Sky Top, on the Blue Brook in the Watchung Reservation and another called Oak Way on the Green Brook on private land in Berkeley Heights.

These affected more than one hundred acres of woodlands and wetlands, which brought environmentalists out in opposition. Other opposition came from the property owners whose lands were targeted. Quickly, the district, the Commission, and the NJDEP agreed that they should separate out the upper basin elements of the plan so that the proposed flood control measures for municipalities in the other portions of the basin would not be delayed.

This was the approach reflected in the "*Final General Reevaluation Report and Supplemental Environmental Impact Statement: Green Brook Sub Basin of the Raritan River Basin*" issued in May 1997. It required some re-engineering of the earlier plan because eliminating the upper basin dry detention reservoirs could lead to increased water levels in the floodplain. The revised plan was a trade-off. The Flood Control Commission and its local supporters had to accept less protection in the lower basin as the cost of moving forward without the upper basin in the plan. Congress demonstrated its support for a compromise by appropriating $3 million for engineering and design. Separately, in a provision of the Energy and Water Development Appropriations Act of 1998 attributed to Senator Robert Torricelli's influence, Congress forbade any use of funds "to construct the Oak Way detention structure or the Sky Top detention structure … as part of the project for flood control," in the Green Brook sub-basin. To deal with the upper basin, the district and Commission cooperated in the creation of an Upper Basin Task Force charged with finding alternatives to the proposed dry detention reservoirs. Its report led to a study of "*Screening Analysis of Flood Control Alternatives: Upper Portion of Green Brook Subbasin*" that was released in January 2001.



Schematic Diagram of a Typical Levee Planned for the Green Brook Flood Control Project

Pump station constructed in Bound Brook, New Jersey, for the Green Brook flood control project in 2005

A Project Cooperation Agreement between New Jersey and the Corps of Engineers was signed in the summer of 1999, although a few pockets of opposition remained. Some residents of Bound Brook, for example, hoped to block parts of the plan that impinged on their property. The state's Sierra Club chapter and other environmental groups voiced their concern that this kind of plan would not limit development in the floodplain. The terms of the agreement called for the non-federal sponsor to cover 25 percent of the costs of the project, and New Jersey wanted the counties in the basin to pay a share of this, but they were balking. Officials in Middlesex County, for example, questioned the need for levees and pumping stations, which were not directly beneficial to their municipalities.

The final project, estimated at $331 million, was announced in June 1999. Construction in Bound Brook, the first priority area, was scheduled to begin the following spring. A press conference announcing the project's go-ahead was held shortly after Governor Christine Todd Whitman declared a drought emergency in New Jersey. At the press conference Governor Whitman noted the incongruity of announcing the onset of a major flood damage reduction project at a time when too little rain was the main problem people faced. In September the need for flood protection became clear when Hurricane Floyd stormed up the East Coast. Many parts of New Jersey were clobbered, but Bound Brook, where two died, may have been the hardest hit spot in the northeast.

Floyd dropped nearly twelve inches of rain on the Raritan basin in just over a day, sending a torrent of muddy water into Bound Brook. A square mile that included the borough's main commercial streets and the homes of roughly half its 10,000 residents was submerged. Floodwaters reached the front porches of some homes and stores, and the second-floor windows of others. Hundreds clung to rooftops until Coast Guard helicopters could reach them. Close to 2,000 people were evacuated to makeshift shelters. Although the floodwaters receded quickly, Main Street did not reopen to regular traffic for three weeks.

A fire rescue vessel in operation in the aftermath of the flooding brought about by Hurricane Floyd in Bound Brook, New Jersey, in September 1999

In May 2000, eight months after Floyd, the freeholder boards in Middlesex and Somerset counties agreed on their cost shares, $9.6 million and $11 million respectively, and the first construction contract was signed in September near the hurricane's first anniversary. "Help is finally coming to Bound Brook" announced the *New York Times.* The first construction element, replacement of a bridge with a higher one, was completed in October 2002. The second phase of the project, involving levees near the new bridge has also been finished. Altogether, the Bound Brook piece of the Green Brook project was roughly three quarters complete in the summer of 2006.

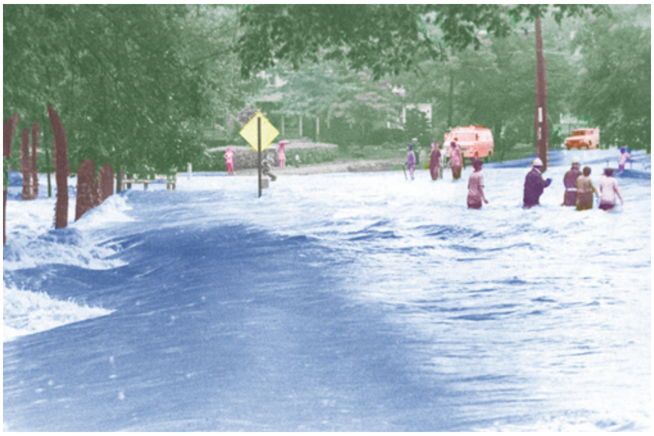
The new Lincoln Boulevard/East Main Street bridge in Bound Brook and Middlesex, New Jersey, rebuilt as part of the Green Brook flood control project, circa 2005

MILLSTONE RIVER BASIN

Hurricane Floyd hit the Somerset County municipality of Manville nearly as hard as it did Bound Brook. One thousand people were evacuated and 1,200 homes damaged, of which nearly a quarter were ultimately condemned. The New York District had been gearing up to look at the area before the storm hit. A month before the storm, the House Committee on Transportation and Infrastructure directed an investigation of potential federal interest in "flood control, environmental restoration and protection, and other allied purposes on the Millstone River." This was done at the behest of Representative Robert Franks who had worked closely with the district on Green Brook.

The Millstone River is a tributary of the Raritan River. Its sub-basin covers 238 square miles in five counties and lies adjacent to and southwest of the Green Brook sub-basin. The Millstone's largest tributary is Stony Brook, located near Princeton, whose basin drains fifty-six square miles. Flooding in the Millstone sub-basin occurs as elsewhere in the Raritan basin as the result of intense local thunderstorms and more widespread events such as northeasters and hurricanes. Flooding comes from both headwater runoff from the upper Millstone River and Stony Brook into the relatively flat floodplain, and from backwater flooding from the Raritan. The Borough of Manville, located at the confluence of the Millstone and Raritan rivers, is victimized by both.

The district's initial report, "*Millstone River Basin, New Jersey: Reconnaissance Study for Flood Control and Ecosystem Restoration*," completed in September 2000, identified potential federal interest in flood control and ecosystem restoration measures for the sub-basin. The *Stony Brook-Millstone Watershed Flood Damage Reduction and Ecosystem Restoration Feasibility Study* is now under way. The reconnaissance report identified Manville, and in particular its Lost Valley neighborhood (so named because of its inaccessibility), as the highest flood protection priority in the area. Lost Valley consists of roughly 500 homes, the majority of which were damaged by Hurricane Floyd. It is bounded on three of its four sides by water, while railroad tracks demarcate its fourth edge. The neighborhood flooded four times between 1968 and 2000, when in the aftermath of Floyd a FEMA program spent $6.2 million buying out forty-two homes in Lost Valley. This was a fraction of the number of homeowners who wanted to sell, but most did not meet an agency standard that future potential flood damage be more costly than the current value of the house.

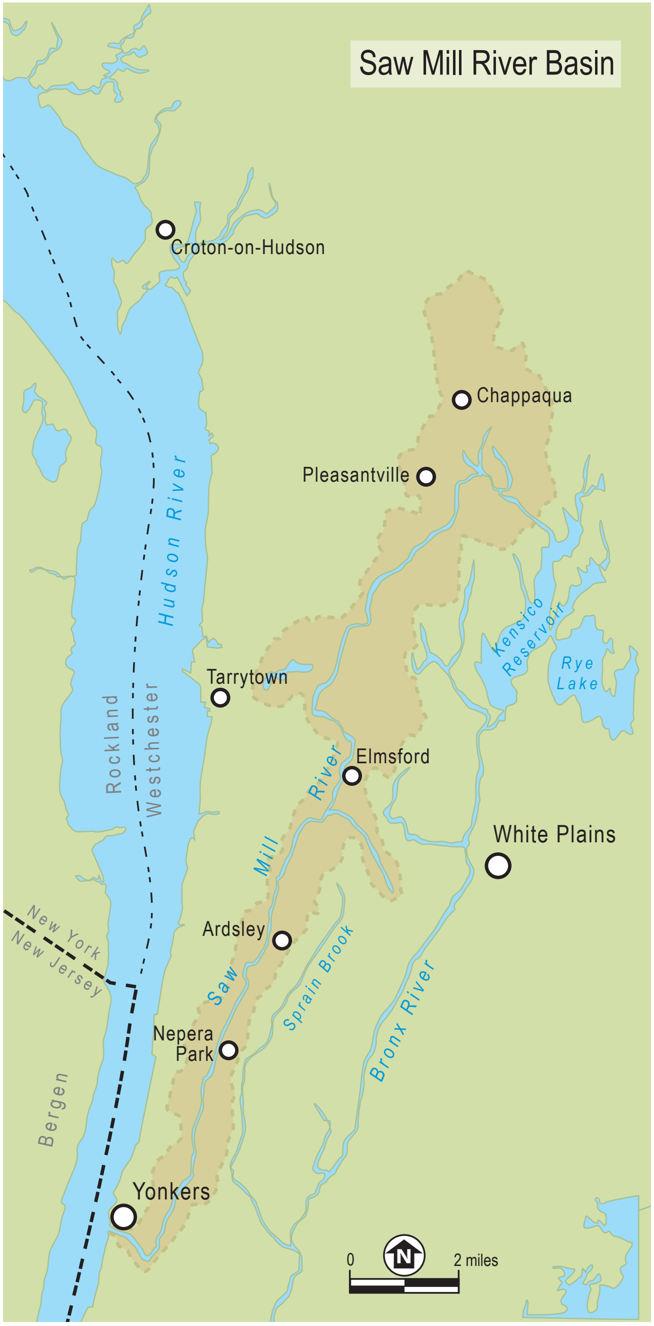


Flooding along the Millstone River in Somerset County, New Jersey, circa 1992

The Millstone basin feasibility study is considering both structural and non-structural alternatives. Non-structural possibilities include flood proofing, further buyouts, ring walls or other flood barriers, raising homes to a higher elevation, natural storage, and emergency management. Structural means might include interior drainage, levees, floodwalls, closure gates, elevation of roadways, detention basins, diversions, and channel modifications. The greatest potential for ecosystem restoration is considered to exist at Carnegie Lake in Princeton. Economic, hydraulic and environmental studies are under way.

SAW MILL RIVER BASIN

The Saw Mill River flows from north to south through southwestern Westchester County and drains into the Hudson River in the city of Yonkers. Its 26.5-square-mile watershed comprises a narrow valley roughly nineteen miles long that averages less than one-and-a-half miles in width. The riverbed, which runs roughly parallel to the Hudson River, is flanked on both sides by gently rolling hills characteristic of the Piedmont geographic province. The Saw Mill River's headwaters rise in a small pond of less than two acres, nearly 500 feet above sea level, in the Town of New Castle approximately thirty-five miles north of New York City. The river descends steeply at first and then gradually for most of its length and then steeply again for a mile and a half into the city of Yonkers where its last 800 yards are piped through an underground conduit that empties into the Hudson River approximately a mile north of the Bronx/Westchester county line. *En route* the basin's character changes from exurban to suburban to urban/industrial.



The Saw Mill River basin typically experiences flooding in spring and fall. Particularly bad floods occurred in 1955, 1972, 1979, 1980 (twice), 1984, and 1999; lesser flooding took place in other years. The Saw Mill River Parkway, on which construction began in the late 1920s, floods frequently because it was built along the floor of the river valley, as was customary with many early twentieth-century road construction projects.

The New York District first conducted a preliminary examination of flooding in the Saw Mill River basin in 1946, considering, but not recommending, a detention reservoir in Eastview, channel improvements and a diversion tunnel in Yonkers, and small projects in Elmsford and Chappaqua. In 1965 it submitted to Congress "an interim report of survey scope" on "[t]he Saw Mill River and Tributaries, New York," which grew out of Congressional actions in the mid-1950s, including the resolution of Senator Bush following Hurricane Diane. This study ruled out a comprehensive plan for basin-wide flood damage protection, but took a closer look at local protection projects in five areas that experienced significant flood damage. Two of these were in Yonkers (one in the industrial sector and one in a residential neighborhood called Nepera Park); one each lay in the villages of Ardsley and Elmsford; and the fifth was close to the river's headwaters in the hamlet of Chappaqua in the Town of New Castle. The study recommended flood protection work in the industrial sector of Yonkers, and in Ardsley and Chappaqua. The Yonkers project was authorized under the Flood Control Act of 1965; the Ardsley and Chappaqua were recommended as small project authorizations.

The flood protection project in Yonkers was the first to get under way. Pre-construction planning that began in December of 1971 led to approval of a general design memorandum in May of 1974. The plan, which covered roughly 2.8 miles of the Saw Mill River, was designed to control flooding in a 130-acre area of the city. It consisted of snagging and clearing (snagging refers to the removal of debris from the channel, while clearing refers to removal of woody vegetation and debris from channel banks and adjacent areas), constructing a concrete flume and floodwalls, channel excavations, and raising seventeen overpasses of various kinds to prevent debris jamming. While not a basin-wide plan, it was predicated in part on the anticipated future construction of other projects in Ardsley, Elmsford, and the Nepera Park section of Yonkers. The Elmsford and Nepera Park projects were planned to work in conjunction with one another. With an initial construction contract under way, a second-phase general design study was begun in December 1974 to be certain that all the assumed conditions still prevailed. This study yielded a report released in February 1976 that replaced a mile or so of vertical steel walls with a U-shaped concrete channel with a smooth bottom. The U-shaped channel was so much more efficient a conduit for the floodwater that it eliminated the need for some of the levees and channel modification, and for raising some of the roads and bridges. The Phase II study also separated out the Nepera Park segment of the work because the district felt that if it were built on its own it could be funded as a small flood control project under the terms of the Flood Control Act of 1948. A second contract for the remainder of the Yonkers project was awarded in March 1978 and substantially completed in July 1983.

Meanwhile, a "*Detailed Project Report for Flood Control along the Saw Mill River in Nepera Park Area of Yonkers, New York*" was issued in February 1979. This considered a number of plans before recommending an earthen levee approximately 1,830 feet long. But this project could not be justified on economic grounds. Further study of the cumulative effect of other Saw Mill River projects, however, led the district to expand the Nepera Park project to cover approximately 8,400 feet of the river. The greater protection provided by the larger project made the cost-benefit ratio favorable despite the considerably increased costs.

Another problem beset the Nepera Park effort. The downstream Yonkers project was not providing the level of protection for which it had been designed. There was a harbinger of this during storms that occurred in March and April 1980 while the project was under construction, but the real failure came during an April 1984 storm when the very flooding occurred that the project had been built to prevent. This led the district to propose a third Yonkers project, a 1,066-foot-long trapezoidal channel of varying depths to connect the Nepera Park piece that was still in the planning stage with the concrete flume at the upstream end of the completed Yonkers flood control project. A "*Project Deficiency Reconnaissance Report*" issued in June 1987 demonstrated that the "tie-in" met the requisite conditions for construction without needing further Congressional authorization.

The outlet of the Saw Mill River on the Hudson River in Yonkers, New York, circa 2000

Work began on what became known as the Nepera Park/ Tie-In Project in March 1994. Before it was completed in June 1997, the work was criticized by Ferry Sloops, a Yonkers-based environmental group, for treating the Saw Mill River as if it were "a drainage ditch" rather than a natural water course. An environmental research group associated with Bard College further alleged that the Nepera Park/ Tie-In was an "artificial channel" that confirmed the Corps of Engineers' "well known" reputation for using "out of date methods for flood control." There was some truth to the contention that the project represented an older style of flood damage reduction, but there is some irony to this criticism as well. Rather than building levees or floodwalls the district was lining the sides of the river channel with porous cloth to keep soil in place, planting trees and shrubs, and taking other environmentally sensitive steps to minimize the detrimental impact of the project.

The channelized and rip-rapped Saw Mill River in Nepera Park, Yonkers, New York, circa 1998

The local flood protection project in the Village of Chappaqua had to overcome some local opposition before it could get under way. Despite this, the Chappaqua project was actually the first of the Saw Mill River basin projects to be finished, at least partly because it fell under the small project authority and therefore did not require individual Congressional authorization or appropriations. The Chappaqua project was designed to protect roughly twenty-seven acres of low lying developed land by reducing flooding along the Saw Mill River and a tributary, Tertia (sometimes spelled Tercia) Brook. It included replacing a little more than a mile of the two streams with a straighter, wider, and deeper trapezoidal channel. In addition, three bridges were replaced and one enlarged, and some associated lowlands were cleared. Opposition came largely from homeowners who preferred the meandering river as a scenic element in their backyards to the straightened and widened channel. When opponents lost a court case before Judge Thomas P. Griesa (who was also hearing the Westway case at the time), they dropped their fight. Work began in June 1981 and finished in September 1982.

The Ardsley project was the smallest of the Saw Mill River basin undertakings, but it took the longest time to complete. With six district-issued reports before the job began in 1987, it was also the most studied by far of the Saw Mill River projects. Originally conceived, like Chappaqua, as a small project authorization, a feasibility study undertaken in 1972 raised the project budget over the $1-million threshold for small project funding. This meant that the project required formal Congressional appropriations for advanced engineering and design work, which it received in 1979. Construction was authorized in the Supplemental Appropriation Act of 1985, and a final project design was settled upon in 1986. The project received construction funds in the fiscal 1988 federal budget and was completed in 1989. As built, the Ardsley project included three reaches of the Saw Mill River covering just over half a mile of the stream corridor. The middle of the three reaches was improved by non-structural means; the upstream reach was relocated a few hundred yards from its existing course, enlarged, and stabilized with riprap or floodwalls; and the downstream reach, the shortest, was not moved, but its channel was enlarged and its banks lined with riprap or floodwall.

Elmsford, despite a recommendation to proceed as a small project along with Chappaqua and Ardsley, has not been built. Following a reconnaissance study completed in 1969 the project was found to be economically unjustifiable in 1974, largely because a factory that had experienced costly losses due to flooding had since relocated. Two years later the project was reevaluated and an economic justification for a modified project in Elmsford and the adjacent community of Greenburgh was found and authorized. In 1986 a general design memorandum laid out eight possible plans, of which two were non-structural, and recommended constructing a twenty-foot-wide channel through the area. In 1989 a Phase II study refined the design, but the project has so far not received funding.

The modified Saw Mill River adjacent to Interstate 87 in Ardsley, Westchester County, New York, circa 1990

In 1999, just two years after the Nepera Park/Tie-In Project was handed over to the city of Yonkers, the New York District returned to the Saw Mill River basin. The Energy and Water Development Appropriations Act of 1999 funded a reconnaissance study of possible federal interest in water resource management in the entire basin including ecosystem restoration and flood control measures. In some respects this is a reversal of a decision the district reached a third of a century earlier when it eschewed a basin-wide approach to flood damage protection, but thinking about these issues had changed a great deal in the meantime. Moreover, even when the district was pursuing the separate Saw Mill River projects, it was studying the area using a basin-wide hydraulic and hydrologic model.

This systematic look at the related issues of flood control and ecosystem quality represented an important change for the district. It reflected the new missions for ecosystem restoration and watershed planning that the Corps of Engineers developed in the late 1990s. The reconnaissance study identified a number of restoration opportunities along the Saw Mill River and called for the next step toward their implementation: a feasibility study of alternatives for ecosystem restoration. Westchester County became the non-federal sponsor in August 2003. The next phase of the project will include a study with two objectives. The report will prioritize plans for restoration of degraded ecosystems, of which there are many in the basin, particularly in downstream sections. It will also present a comprehensive watershed management plan.

WATERBURY DAM

The recent history of the Waterbury Dam, located just north of Burlington, Vermont, provides a good illustration of the district's activities in the area of dam safety. This dam was originally built by the Civilian Conservation Corps in 1935 under Corps of Engineers supervision. Located on the Little River, three miles upstream from its junction with the Winooski River, the dam consists of an earthen embankment approximately 1,850 feet long and rising 187 feet above the original river channel. In 1981 the district lowered the reservoir pool after the discovery of seepage and settlement in the embankment raised safety concerns. In 1984, the Corps injected filler material, rebuilt a portion of the dam toe, grouted some of the original river channel, and installed a bypass conduit, after which the reservoir was refilled.

Follow-up studies that began in 1987 showed that the dam may have settled in its river-gorge setting, creating voids that could erode it internally. Because of this discovery, the district recommended in 1991 that the state of Vermont arrange for periodic evaluations of the dam, particularly in the river gorge area. Based upon a 1999 evaluation, Vermont asked the Corps of Engineers to look at the condition of the dam under its Dam Safety Assurance Program authorized in 1986. In 2000, while the district's study was under way, Vermont lowered the level of the reservoir after instrument readings raised concerns about the dam's integrity. The project design team, a multidistrict group led by the New York District that met virtually in cyberspace rather than physically, initially recommended a $25.7-million repair project to build a filter shaft within the dam structure to correct the seepage. This project was modified during the value engineering phase with the estimated cost being reduced to $20.9 million following the suggestion that the filters be installed by drilling rather than open excavation. The project delivery team received a Corps of Engineers virtual team award for the Waterbury project. Work began in July 2002 and continued into 2006. In September 2006 Vermont began allowing the reservoir to refill.

The New York District has been engineering projects to reduce the threats to life and property caused by flooding in the region for nearly three quarters of a century. In the last thirty years, while much has been accomplished, the population living in the floodplains of the district's civil works boundaries has grown considerably. Dangerous floods will remain a feature of life in these areas in the foreseeable future, and the district services should continue to be in demand.

The Waterbury Dam on the Little River, Waterbury, Vermont, in 2002

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Official New York District documents, such as reconnaissance, feasibility, limited reevaluation, engineering-design-documentation, after-action, and other reports, project management plans, and general design memoranda, provided much of the project-specific data for this chapter. While many of these public documents were loaned by district staff working on successor or related projects, there were at the time of writing four principal locations within the Jacob K. Javits Federal Building where district reports could be found: the libraries of the Engineering Division, the Planning Division, the Environmental Analysis Branch, and the Programs and Projects Management Division.

In addition to the district reports, and the books and articles listed below, oral history interviews informed this chapter. Samuel Tosi spoke of all the major flood damage protection efforts in the period. He was especially informative about the Passaic River basin. Louis Pinata and Stuart Piken recalled the Saw Mill River projects. Stuart Piken, Eugene Brickman, and Frank Santomauro all addressed the Passaic River basin. William Slezak and Stuart Piken recollected the Green Brook project. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Informal conversations with other current and former New York District employees, particularly Paul Tuminello on the Passaic River basin, also provided important information. Back issues of the *District Times*, the New York District's internal newsletter, and of *Engineer Update,* the Corps of Engineers' monthly publication, were helpful as well.

Most of the controversies discussed in this chapter took place in the New York metropolitan area and were covered in the *New York Times* and other local newspapers, although, over the years, the *New York Times* has tended to pay more attention to the effects of disastrous floods than to efforts at preventing them. The newspapers were researched using *Proquest Historical Newspapers* and *LexisNexis Academic*.

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6
The Harbor

It is a challenge to convey the totality of the New York-New Jersey harbor. The renowned travel writer James Morris simply called it "the great port." The Statue of Liberty, the harbor's symbolic and physical center, is recognized internationally as a representation of America. The harbor was the nation's front door for centuries; and, despite the post-World War II growth in southern and western ports of entry, in many respects it still is. The New York metropolitan area grew to its place among the world's great conurbations by taking advantage of the vast natural advantages the harbor provided. The New York District's involvement in the harbor is treated here in three sections: channel deepening; dredged material disposal; and debris collection

Upper New York Bay looking north toward the Statue of Liberty

View of Upper New York Bay looking south toward the Verrazzano Narrows and Lower New York Bay, circa 2000

The harbor is large and complicated. Its approximately 1,500 square miles comprise one of the most intricate estuaries in the world. It lies where two unsynchronized tidal bodies of water – the Atlantic Ocean and Long Island Sound (via the East River) – meet the Hudson River. This tripartite confluence of tides and currents creates a complex hydraulic system that has bedeviled countless ship captains and pilots. For example, when the tide begins its ebb phase in Newark Bay, the Arthur Kill is flooding and bay water exits through the Kill van Kull. When the Kill van Kull begins its flood tide, Newark Bay is ebbing and the bay water flows into the Arthur Kill.

The navigable waterways within twenty-five miles of the Statue of Liberty (the definition of the Port district used by the Port Authority of New York and New Jersey) encompass: four major rivers; seven bays; five tidal straits; four points, four hooks, two necks; a number of creeks, coves, and inlets; and several other features. The estuary, which in its entirety can also be thought of as an archipelago, contains nearly thirty islands.

The New York-New Jersey harbor is as impressive in its economic might as it is in its hydrology and geomorphology. It is the largest port on the East Coast, the third largest in the nation behind New Orleans, and Los Angeles/Long Beach, and the largest petrochemical port in the United States. Its 750 miles of waterfront, 2,600 acres of marine facilities, and over one million linear feet of berthing contribute an estimated quarter of a million jobs and $22 billion annually to the regional economy. More than $132 billion worth of cargo passed through Port Authority facilities in 2005. This freight weighed more than eighty-five million metric tons (more than 187 billion pounds).

It was moved by the 5,322 ships that made calls to the port that year, nearly fifteen vessels a day on average. Measured by weight, the top three import commodities were beverages, vehicles, and plastic. The top three exports were wood pulp, plastic and machinery. The New York-New Jersey harbor is the leading ocean-borne auto handling port in the country, with 722,411 vehicles (cars, small trucks, vans, sports utility vehicles, and other personal vehicles) entering the United States through the port in 2005.

The New York Shipping Association uses a 260-mile radius from the Statue of Liberty to define the New York-New Jersey harbor's economic impact area, for which an estimated 82 percent of the cargo that moves through the port is destined. Nearly sixty million people, roughly 20 percent of the national population, live within this essentially eleven-state region. By some measurements of an even more extended region, the New York-New Jersey port serves 35 percent of the American population.

COMPONENTS OF THE NEW YORK-NEW JERSEY HARBOR

The New York-New Jersey harbor is made up of an extraordinary range of rivers, streams, tidal straits, bays, inlets, coves, islands, and littoral landforms all clustered around the mouth of the Hudson River and adjacent rivers in the vicinity of New York City and nearby northern New Jersey. Its main bodies of water are: Upper New York Bay; Lower New York Bay; Newark Bay; the Verrazano Narrows; the lower Hudson River (also known as the North River); the East River; the Arthur Kill; the Kill van Kull; Jamaica Bay; and the Harlem River.

A more complete list of the harbor's features includes:

Rivers and Streams

Alley Creek
Bronx River
Coney Island Creek
Dutch Kills
English Kills
Fresh Kills
Gowanus Canal (formerly Gowanus Creek)
Hackensack River
Hudson River (North River)
Hutchinson River
Luyster Creek
Main Creek
Maspeth Creek
Newton Creek
Passaic River
Rahway River
Raritan River
Richmond Creek
Sherman Creek
Smith Creek
Springville Creek

Tidal Straits

Anchorage Channel
Arthur Kill
Bronx Kill
Buttermilk Channel
East River
Grass Hassock Channel
Harlem River
Hell Gate
Kill van Kull
Long Island Sound
Pumpkin Patch Channel
Rockaway Inlet
Spuyten Duyvil
Verrazano Narrows

Bays, Inlets, and Coves

Bowery Bay
Dead Horse Inlet
Eastchester Bay
Flushing Bay
Gowanus Bay
Grassy Bay
Gravesend Bay
Great Kills Harbor
Head of Bay
Jamaica Bay
Little Bay
Little Neck Bay
Lower New York Bay
Newark Bay
Powell's Cove
Prince's Bay
Raritan Bay
Sheepshead Bay
Upper New York Bay

Islands

City Island
Ellis Island
Governor's Island
Hart Island
High Island
Hoffman Island
Isle of Meadow
Liberty Island
Manhattan
North Brother Island
Long Island
Prall's Island
Randall's Island
Riker's Island
Robbins Reef
Roosevelt Island
Shooter's Island
South Brother Island
Staten Island
Swinburne Island
U Thant Island (Belmont Island)
Ward's Island

Littoral Landforms

Bergen Point
Coney Island (formerly an island)
Constable Hook
Paulus Hook
Red Hook
Rockaway Point
Rodman's Neck
Sandy Hook
Throg's Neck
Ward's Point
Willet's Point

Port Facilities

Atlantic Basin
Bergen Basin
Erie Basin
Gowanus Canal
Navy Yard Basin
Port Newark-Elizabeth Marine Terminal
Thurston Basin
World's Fair Marina

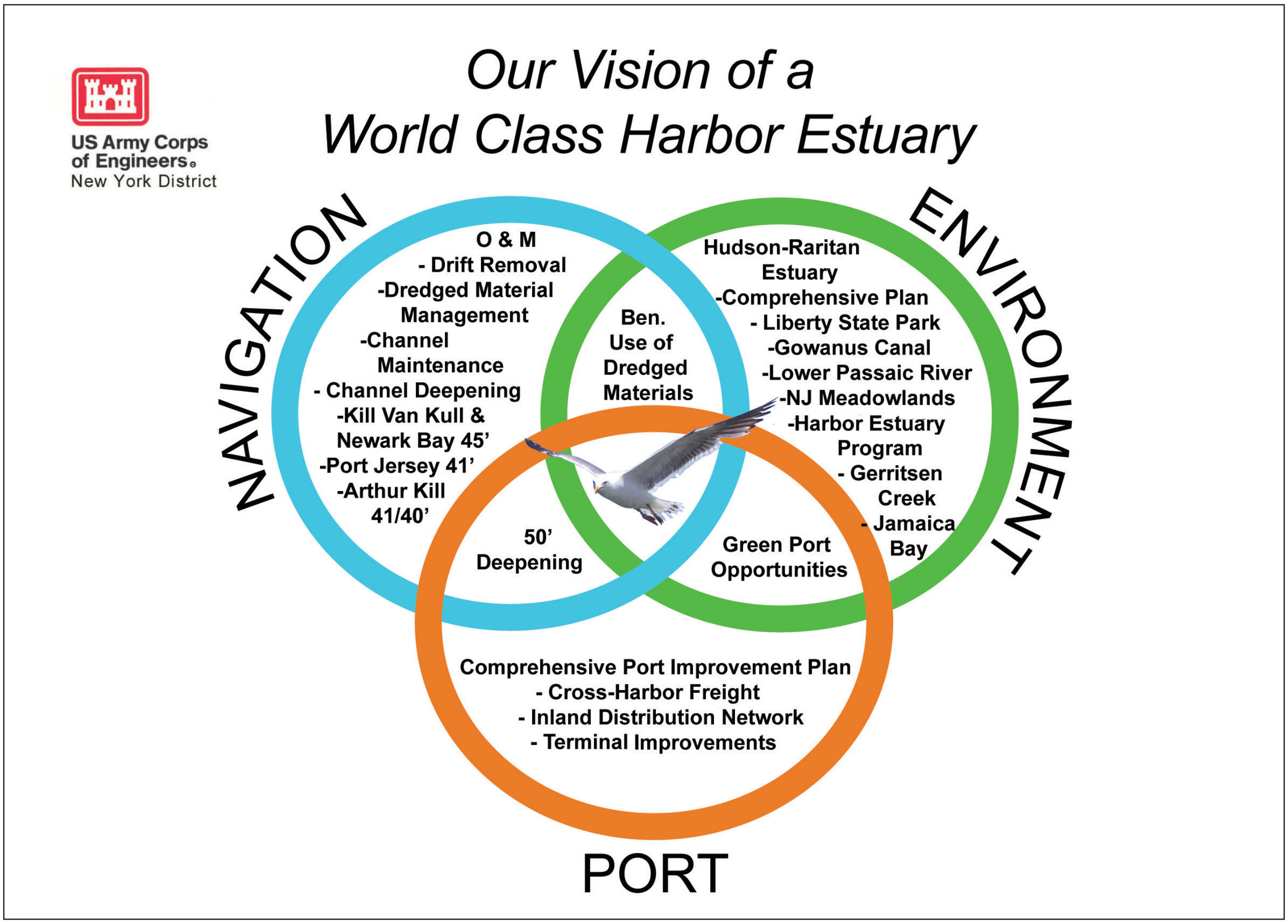
The harbor is also complicated politically. It is encompassed by two states, eleven counties, and dozens of municipalities. It is supervised by an array of local, state, and federal agencies plus the Port Authority of New York and New Jersey. There are twenty-six Congressional districts in or partly in the port district.

The Corps of Engineers has been involved in maintaining the New York-New Jersey harbor for commerce since 1851 when the Chief Engineer, Brigadier General Joseph G. Totten, worked with New York City on the problem of inter-pier garbage dumping. In the Rivers and Harbors Act of 1888 Congress established a program whereby the Corps regulated encroachments in the harbor. There are now more than a dozen pieces of legislation that touch on the subject – about half of them enacted during the burst of Congressional environmentalism that occurred between the mid-1960s and 1980. So deeply is the New York District immersed in the waters of the New York-New Jersey harbor that in 1987 its newsletter, the *New York District Times*, suggested the district's entire history could be charted through the harbor. In the early 1980s the district published a separate brochure about "*The Corps in the Harbor*." During the fiscal year 2006, harbor-related activities in the New York District absorbed half of its civil works budget.

The district created a distinct Harbor Programs Management Branch inside the Programs and Project Management Division in the mid-1990s. It has a threefold mission focused on achieving an appropriate balance between altering, enhancing and protecting nature. The branch manages the planning, design, and construction of new federal navigation channels in the Port of New York and New Jersey. It also conducts environmental restoration and remediation in the harbor, and supports the Operations Division in emergency response, as necessary.

In April 1999 the newest chapter in the district's harbor history opened when the U.S. House of Representatives Committee on Transportation and Infrastructure directed the Corps to determine "the feasibility of environmental restoration and protection relating to water resources and sediment quality within the New York and New Jersey Port District, including but not limited to creation, enhancement, and restoration of aquatic, wetland, and adjacent upland habitats." In response the district initiated a reconnaissance study to identify environmental needs in the Hudson-Raritan estuary, an area whose nearly six thousand people per square mile have taken their toll on the natural environment. In June 2000 the district reported that its preliminary reconnaissance study found a significant federal interest in environmental restoration, and called for a more detailed feasibility study of environmental restoration in the estuary. Following a further report, "*Restoration Opportunities in the Hudson–Raritan Estuary*," released in May 2001, the district entered a cost-sharing agreement with the Port Authority for a Hudson–Raritan Estuary Ecosystem Restoration Feasibility Study, which is discussed in Chapter 8.

While that work was under way the district began thinking of ways to keep its various approaches to the harbor in step with one another. The result was the overlapping three-ring symbol labeled "Our Vision of a World Class Harbor Estuary." The image is quite striking. It is superimposed over a background photograph that shows the superstructures of container port cranes behind abandoned pilings, which combine to suggest the close connection between the functioning port and the cleanup and restoration efforts. The three rings represent navigation, environmental issues, and facilities within the port itself. In the navigation ring are channel deepening projects and maintenance dredging; the comprehensive harbor estuary plan and its first specific restoration projects are in the environmental ring; the port ring has the comprehensive port improvement plan and some long-term freight handling and moving issues that the district is involved with mostly as an issuer of permits. In the center where the three rings converge there is an image of an osprey, a bird whose presence in the harbor symbolizes a successful balance of business and environmental concerns.



ENLARGING THE NAVIGATION CHANNELS

Despite the New York-New Jersey harbor's inherent gifts, it did not become a great enabler of prosperity without considerable human intervention. To take an example from the district's past, the treacherous reefs and rock beds of Hell Gate at the junction of the East River and Long Island Sound, where the tides never coincide, were damaging or sinking an average of roughly three ships a day in the late nineteenth century. In the mid-1880s, after several years of drilling, tunneling and blasting, Corps official Lieutenant Colonel John Newton completed the deepening of the channel to twenty-six feet, improving navigation by eliminating the most dangerous reefs at Hell Gate. In removing Flood Rock, the single largest obstruction, on October 10, 1885, Newton detonated more than a quarter million pounds of dynamite, over six times more than had ever been used before in a single explosion. Nine acres of riverbed were blown out from the channel, sending geysers more than 250 feet into the air. It is a safe assumption that this was the largest man-made explosion in history until an atomic bomb was detonated in 1945. Though it is without the rock beds and reefs of the past, Hell Gate still has dangerous currents. Some consider its bottom to be the wildest, most inaccessible area in the region.

The harbor's natural controlling depth is eighteen to nineteen feet below the average low tide level. Though this is relatively deep by natural standards, it has been insufficient to support the maritime commerce of greater New York for some time. As early as the 1850s, deep-draft vessels had reached a size that prevented access to the port without the help of a high tide to lift them over the harbor's main threshold at Sandy Hook. To make matters more difficult, the entire estuary – the Upper and Lower New York bays, the kills, and Newark Bay – builds up silt rapidly because fine-grained sediments wash steadily down into the harbor from numerous tributaries. Thus, ships have required man-made channels to navigate the harbor for more than a century and, once dug, these channels have needed ongoing maintenance dredging to prevent shoaling. The steady increase in the size of vessels, which is both cause and consequence of the region's economic growth, has necessitated periodic enlarging of the channels.

What became the Ambrose Channel, the main entrance to Lower New York Bay, was a little used conduit fourteen feet deep when the Corps of Engineers was authorized to deepen it to forty feet in 1899. The job was finished in 1907 at an estimated cost of $4 million – equivalent to roughly $83 million in 2005 dollars. Reflecting the importance of the New York-New Jersey harbor, this was one of Congress's largest civil works commitments up to that time. In 1937 Ambrose, and the Anchorage Channel to which it connects, were authorized for widening to 2,000 feet (wider at channel bends) and for deepening to forty-five feet – dimensions that were maintained for half a century. The other major entry channels were all authorized for deepening to thirty-five feet at various times between 1935 and 1966. There were four of these.

Navigation Channels in the New York-New Jersey Harbor
Hudson River
Manhattan
East River
Port Newark
Newark Bay
Claremont
Buttermilk
Port Elizabeth
Red Hook
Newark Bay
Port Jersey
Upper New York Bay
New Jersey
Kill van Kull
Bay Ridge
Arthur Kill
Anchorage
Brooklyn
Staten Island
Lower New York Bay
Arthur Kill
Ambrose
Raritan Bay Reach
Sandy Hook
Raritan Bay
New Jersey
Atlantic Ocean
0
N
10 miles

THE TERM "KILL"

The term "kill" comes from the Dutch word for a small body of running water; it is a residue of the Dutch colony of New Amsterdam. Northern New Jersey and the Hudson River valley are the only places in the United States where this term is commonly used, a reminder that the area was colonized by another European nation before the English.

A westerly adjunct to Ambrose known as the Main Ship Channel connected with the Naval Weapons Station at Earle, New Jersey. It also intersected the Sandy Hook or Bayside Channel, which reached into Raritan Bay. A third channel extended from the Bayside Channel up the narrow Arthur Kill between New Jersey and Staten Island affording access to the Bayway refinery and other petroleum terminals. Finally, the Kill van Kull and Newark Bay Channel served as the main artery linking Newark Bay to the Upper New York Bay.

The district does little in the New York-New Jersey harbor that does not involve the Port Authority of New York and New Jersey. The Port of New York Authority, as this entity was known until 1972, was created in 1921 by compact between New York and New Jersey to provide "a better coordination of the terminal, transportation, and other facilities of commerce in, about, and through the Port of New York." The Port Authority began to invest in the west harbor in 1947 when the city of Newark gave it a long-term lease on Port Newark. By 1954 the Authority had invested $20 million in Port Newark and it boasted the most modern terminals on the East Coast.

Because business grew rapidly, the Port Authority in 1956 drained a square mile of tidal marshland south of Port Newark for another terminal, the Elizabeth-Port Authority Marine Terminal. It intended to build a standard break-bulk marine terminal where freight for export was unloaded from trucks into dockside storage sheds and then hoisted onto ships. (Imported goods went through the same sequence in reverse.) But Malcom McLean, a former truck driver who had turned a single truck into a huge freight transportation company, persuaded the Port Authority that containerization was the future of shipping. When the 1,165-acre Elizabeth-Port Authority Marine Terminal opened in August 1962 it had been redesigned as a container terminal.

Malcom McLean, the father of containerized shipping, at the Elizabeth-Port Authority Marine Terminal, circa 1975 [Maersk-Sealand]

CONTAINERS AND THE NEW YORK-NEW JERSEY HARBOR

A twenty-foot-equivalent unit (TEU) is a standard way of measuring containerized cargo. It is equal to one standard 20×8×8.5-foot container. Most cargo containers in use today are forty feet long and thus represent two TEUs.

In 2005, an estimated 90 percent of the world's trade moved in containers, and the port of New York and New Jersey handled nearly 4.8 million TEUs. Trade between the United States and Asia has been particularly stimulated by the time and cost savings that containerization has made possible. Shipments from Hong Kong to New York, which took approximately fifty days to transport in 1970, today take only seventeen days.

The new terminal, which had required the dredging of Bound Creek into a new Elizabeth Channel on the southern boundary of Port Newark, handled 1.5 million tons of cargo on 242 vessels in 1963, its first full year of operation. Over the course of the next decade the Elizabeth-Port Authority Marine Terminal became the epicenter of containerized shipping, and thereby a facilitator of the huge expansion in international trade that has redefined the global economy. By 1974 container ships accounted for 70 percent of the total dry goods vessel movements into Newark Bay. The development of major containerized shipping facilities at the Port Newark/Elizabeth marine terminal relocated to the west the center of gravity of the harbor's shipping industry and it provides the context within which all subsequent district channel modification efforts took place.

In 1972 the House Committee on Public Works adopted a resolution sponsored by New Jersey Representative Peter Rodino calling on the Corps to consider "deepening and easing of bends of channels... to accommodate deeper draft and otherwise larger ocean-going vessels" using the Port Newark/Elizabeth marine terminal. This study received funding in 1974, when the combined terminals covered three square miles with more than 38,000 linear feet of wharfing. Port Newark boasted seventeen cargo terminal buildings, thirty-four cargo distribution centers, and other structures. It had seventeen miles of roadway and thirty-eight miles of railroad track. The Elizabeth-Port Authority Marine Terminal had nineteen container cranes and forty-five buildings of various types.

The Elizabeth-Port Authority Marine Terminal at the mouth of Newark Bay, circa 1990

Container ship docked at the Elizabeth-Port Marine Terminal, circa 1990

The study of deepening the channels associated with the Port Newark/Elizabeth marine terminal was completed in July 1980. The district recommended a forty-four-foot-deep channel, widened as appropriate and including a turning basin at the Elizabeth-Port Authority Marine Terminal. The next year the Board of Engineers for Rivers and Harbors, while generally concurring with the district report, recommended a depth of forty-five feet (the *de facto* depth standard for channels in deep water ports) for the channels serving the Port Newark/Elizabeth marine terminal. In January 1985, the Assistant Secretary of the Army (Civil Works) called for a reanalysis to decide between the competing depth recommendations. In November the Office of Management and Budget recommended forty-four feet to Congress, unless it could be demonstrated that adding the extra foot would improve the benefit to cost ratio of the project.

Cranes for loading and unloading containerized cargo at the Elizabeth-Port Marine Terminal, circa 1990

By this time Port Newark boasted a frozen meat inspection building, a bulk liquid handling facility for refined and edible grades of oil, a copper rod production plant, a plant that processed Brazilian orange juice, several automobile preparation centers, and many other operations. The container terminal at the Elizabeth-Port Authority Marine Terminal had expanded to include twenty-three cranes and seventy-one buildings. Traffic-related accidents were frequent, particularly around Bergen Point, and shippers were experiencing numerous delays. It was clear that expansion of the channels providing access to these terminals was warranted.

The Port Authority was not the only party with terminal facilities in the harbor interested in the depth of navigation channels. The state of New Jersey and New York City both wanted the channels to their terminals to be of comparable capacity to those that led to Port Authority facilities. With the backing of their respective Congressional supporters, additional studies were completed in the early 1980s for deepening the Arthur Kill, Claremont Terminal, and Port Jersey channels. The Claremont Terminal Channel is a 10,000-foot-long channel in Jersey City owned by the state of New Jersey; the Port Jersey Channel is located in Jersey City between the Global Marine Terminal, to which it provides access, and the former Military Ocean Terminal in Bayonne. Federal interest was found at Arthur Kill and Port Jersey, but not at Claremont.

A project in the Kill van Kull and Newark Bay channels, which provide access to the Port Newark/Elizabeth marine terminal complex, was authorized through a large supplemental appropriation in 1985. Despite the recommendation from the Office of Management and Budget, Congress allowed deepening of the existing federal channels in Newark Bay and the Kill van Kull to forty-five feet (forty-seven feet in rock and hard material), and widening at seven selected points, including a turning basin for ships backing into the Elizabeth-Port Authority Marine Terminal.

A clamshell dredge at work in the Arthur Kill in the late 1980s

The 1985 supplemental appropriation was in actuality an interim solution to the stalemate that had developed between Congress and the Reagan administration over the terms of the omnibus water resources appropriation bill that became the Water Resources Development Act of 1986 (a dispute described earlier in Chapter 1). Since no major water bills had been enacted since 1970, there was a considerable backlog of water projects awaiting funding nationwide. The supplemental appropriation enabled some important projects to proceed while numerous other issues were being worked out. Its terms stipulated that binding local cooperation agreements, including an agreement on cost sharing, were to be signed between the Corps and the non-federal sponsors by the end of June 1986.

The district had four important projects authorized in the 1985 supplemental appropriation, and local cooperation agreements on each were completed before the deadline, an achievement of which the involved participants were justifiably proud. But, the Kill van Kull project had to wait for resolution of the deadlock in Congress anyway, because the Assistant Secretary of the Army (Civil Works), Robert K. Dawson, refused to approve any local cooperation agreements on navigation projects until legislation passed that sanctioned new cost-sharing formulas and allowed port authorities to impose user fees.

The close working relationship between the district and the Port Authority made it relatively easy to meet the deadline on the project for improvements to the federal navigation channels in the Kill van Kull and Newark Bay. The two agencies agreed on a likely cost-sharing formula while the legislation was still taking shape. At the recommendation of the Port Authority, the project was broken into two phases. Phase I, deepening the channels from thirty feet to forty feet, was to be followed by a Phase II, which would take them down to forty to forty-five feet.

RECENT PROJECTS IN THE NEW YORK-NEW JERSEY HARBOR

- Arthur Kill Channel, Howland Hook Marine Terminal, Deepening to Forty-one Feet, New York and New Jersey
- Dredged Material Management Plan for the Port of New York and New Jersey
- Elders Point Restoration, Jamaica Bay, Salt Marsh Islands, New York
- Gowanus Bay and Canal Ecosystem Restoration Study, New York
- Hackensack Meadowlands Project Mitigation and Restoration, New Jersey
- Hudson-Raritan Estuary Ecosystem Restoration, Liberty State Park, Jersey City, New Jersey
- Hudson-Raritan Estuary Ecosystem Restoration, New York and New Jersey
- Hudson Raritan Estuary-Hackensack Meadowlands Environmental Restoration, New Jersey
- Hudson-Raritan Estuary Lower Passaic River Restoration Project, New Jersey
- Joseph P. Medwick Park Restoration, Carteret, New Jersey
- Kill van Kull/Newark Bay Channels Navigation Improvement, New York
- New York-New Jersey Harbor Adjacent Channels Navigation Project, Port Jersey, New Jersey
- New York-New Jersey Harbor Anchorage Navigation Project, New York and New Jersey
- New York-New Jersey Harbor Navigation Project
- Salt Marsh Mitigation at KeySpan Corporation, Staten Island, New York
- Woodbridge Creek Restoration and Mitigation, Woodbridge, New Jersey

Some in the district felt this was unwise and opinion has remained divided on the appropriateness of this approach. Ostensibly, the reason for breaking the job into two phases was that it would make it easier to keep these very busy channels open to navigation while the work was under way. Some observers felt the Port Authority was being shortsighted because of how urgently the deeper channel was needed. The extended two-phase schedule wasted time, made the job more expensive to build in the long run, and was more environmentally disruptive because the blasting required for the deepening had to be done twice. Others have suggested the Port Authority was wise in its approach for two main reasons. First, the Authority may have sensed that Congress was less likely to fund the larger project, and so broke it down into two smaller pieces for which Congressional support was more likely. Equally important, the Authority reasoned that even if deeper channels would be necessary in a decade or so, why pay for them before they were necessary.

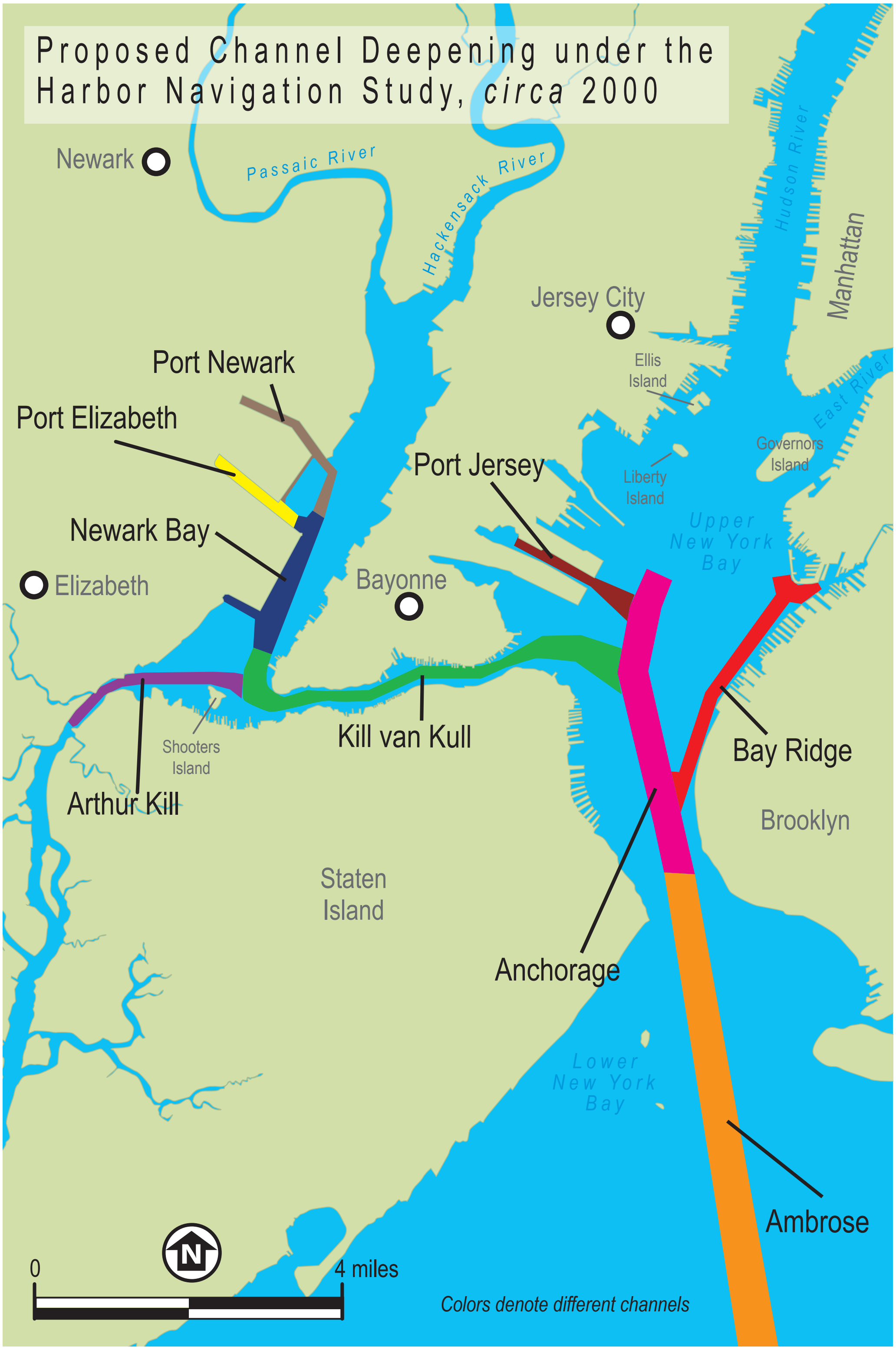
Work began on the Kill van Kull and Newark Bay channel deepening project in July 1987. When the last Phase I contract was completed in September 1995, it added up to one of the largest dredging projects ever undertaken by the Army Corps of Engineers. As work on Phase I of the Kill van Kull project was nearing completion, the Port Authority and the district were already exploring Phase II, the deepening of the Kill van Kull and Newark Bay channels to forty-five feet. These were not the only channels where work was under way. The partner agencies were also moving forward on the Port Jersey Channel and the Arthur Kill. Their principal motivation in all cases was the increasing size of the ships. The Arthur Kill, for example, was heavily used by large oil tankers, which had by the early 1980s reached sizes that made efficient navigation a challenge, and New York City and the oil industry were applying pressure for its deepening. As large as the tankers were getting, the dimensions of container and dry bulk vessels began to grow so rapidly in the 1980s, that by mid-decade they were reaching and even exceeding the dimensions of liquid bulk ships. Ultimately, it was the benefits to be derived from accommodating the larger container ships that justified all these projects.

What happened next reflects a familiar pattern in Corps of Engineers projects. It is evident in shoreline protection efforts, storm damage reduction planning, and elsewhere. The civil works process – planning, design, political approvals, and so forth – takes a lot of time. The bigger the project, the more comprehensive the plan, and the more political entities with a stake in its outcome, the longer the process will generally take. In addition, before the details of a project are hammered out among involved parties, sometimes a new direction from above – an act of Congress or a policy of the executive branch – is charted.

The Water Resources Development Act of 1996 authorized "a comprehensive study of navigation needs at the Port of New York-New Jersey (including the South Brooklyn Marine and Red Hook Container Terminals, Staten Island, and adjacent areas)." The idea was to evaluate the need for channel depths of fifty feet or even more to accommodate the deeper-draft vessels that were joining the global commercial fleet. This was officially known as the New York and New Jersey Harbor Navigation Study. When it began in 1997 there were three projects authorized by the Water Resources Development Act of 1986 that were undergoing limited reevaluation studies to ascertain whether conditions had changed since the "*New York Harbor and Adjacent Channels – Port Jersey Channel Feasibility Report*" was completed in 1987. One of these studies, Phase II of the Kill van Kull and Newark Bay channel deepening project, was approved in October 1997. It recommended deepening to forty-five feet the channels from the confluence of the Kill van Kull and Anchorage channels to the northern edge of the Port Newark Reach in Newark Bay. This boundary was recommended because the Port Authority, on cost grounds, withdrew from consideration the deepening of the Port Newark Channel and a portion of the Newark Bay Channel. Studies of projects to deepen the Arthur Kill to forty and forty-one feet (forty-three feet in rock or other hard material), and the Port Jersey Channel to forty-one feet (also forty-three feet in rock or other hard material) were at earlier stages of completion. These three projects became known as the "predecessor projects."

The report on the New York and New Jersey Harbor Navigation Study, when it was released in 1999, concluded that channel depths were indeed limiting safe and efficient access to the port's container-handling facilities, and that the problem was likely to get worse because the silhouettes of yet larger container ships could be seen on the horizon. The study proposed deepening nine major navigation channels serving the harbor: the entire length of the Ambrose Channel to fifty-three feet; all other channels to fifty feet (fifty-two feet in rock and hard material) – the Anchorage Channel; the Port Jersey Channel, from its juncture with Anchorage Channel to the Global Terminal and Military Ocean Terminal in Bayonne; the Kill van Kull from its juncture with the Anchorage Channel to the Arthur Kill; the Newark Bay Channel, from its juncture with the Kill van Kull to the juncture with the Elizabeth Channel, including three small pier-head channels; and the Arthur Kill from its juncture with the Kill van Kull and Newark Bay to the southernmost berth at the Howland Hook Marine Terminal. Deepening the Bay Ridge Channel, from its juncture with the Anchorage Channel to the South Brooklyn Marine Terminal was made "subject to commitment to rehabilitate the South Brooklyn Marine Terminal." The study also proposed mitigation measures for "unavoidable impacts," to include the restoration of eleven acres of inter-tidal wetlands and construction of 7.6 acres of littoral habitat.

The main impact of the Harbor Navigation Study, though, was contained in its identification of potential cost savings if the entire nine-channel undertaking were treated as one project. This was, at least in part, a function of the lesson learned when splitting the Kill van Kull-Newark Bay project into two separate phases proved to be so much more expensive. A consolidated project cooperation agreement could expedite the work in many ways, with


Proposed Channel Deepening under the Harbor Navigation Study, *circa* 2000
Newark
Passaic River
Hackensack River
Hudson River
Manhattan
Jersey City
Ellis Island
Port Newark
Port Elizabeth
Port Jersey
Liberty Island
Governors Island
East River
Upper New York Bay
Newark Bay
Elizabeth
Bayonne
Kill van Kull
Shooters Island
Arthur Kill
Bay Ridge
Brooklyn
Staten Island
Anchorage
Lower New York Bay
Ambrose
N
0
4 miles
Colors denote different channels

potential savings resulting from coordinating the drilling and blasting for the channels in the study plan with the same tasks for those projects already on the books. Congress authorized the entire nine-channel undertaking in the Water Resources Development Act of 2000. The estimated federal cost was nearly $744 million and the non-federal share over $1 billion. The actual cash expense of the non-federal sponsors would be reduced through credits granted for the costs incurred in design and construction work carried out on predecessor projects before the project cooperation agreement was signed. This work was in addition to the roughly $1 billion spent on the predecessor projects.

A project cooperation agreement was signed for deepening the Kill van Kull and Newark Bay Channel to forty-five feet in January 1999, and the first construction contract was awarded two months later. Eight contracts were awarded for this project, the last of which was completed in November 2004. The project cooperation agreement for deepening the Arthur Kill to forty and forty-one feet was signed in July 2002 and the first of five construction contracts for this work was awarded in May 2003. Work on the second contract began in March 2005.

The New Jersey Department of Transportation, the primary sponsor, and the Port Authority, the limited sponsor, signed a project cooperation agreement in July 2002 for the third predecessor project, the deepening of the Port Jersey Channel to forty-one feet. The first of three contracts was awarded in January 2003 and finished eighteen months later. The second construction contract was awarded in February 2004 and completed in November 2005. Under these contracts a partially usable forty-one-foot-deep channel was dug, although it was not the channel originally designed because taking the Port Jersey Channel to fifty feet required some realignment, and the forty-one-foot channel was excavated along the path of the future channel rather than the pre-existing one. The third contract will consolidate construction of the remaining forty-one-foot channel with the fifty-foot channel. During design work for the deeper channel an approximately ninety-five-year-old Passaic Valley Sewerage Commission discharge tunnel was discovered. The third contract will be advertised when the issue is resolved of how to safely dredge the channel over the sewer outflow pipe. Once under way, this work is expected to take approximately two years to complete.

Congress responded to the Harbor Navigation Study's recommendations in its "Conference Report for the Fiscal Year 2002 Appropriations Act" by combining into one harbor deepening project the amounts from the budgets of all phases of the predecessor projects and all the newer projects in the recommended plan of study. In response to this direction, the district began investigating in detail the economies to be found in a consolidated plan. "*The Limited Reevaluation Report and Environmental Assessment on Consolidated Implementation of the New York and New Jersey Harbor Deepening Project*," issued in January 2004, mapped the way forward. By excavating the remaining parts of the predecessor projects concurrently with the corresponding parts of the recommended plan, approximately $100 million (roughly 10 percent of the total project estimate) could be saved. The economies would come primarily in channel segments that were predominantly rock or other hard material because going directly to fifty feet would require drilling and blasting only once in each location. This would lead to efficiencies in removing excavated material and transporting the equipment for drilling and blasting. Construction began in early 2003 in the Ambrose Channel.

The Port Authority was anxious to get this massive work under way. In the 1990s it went through an excruciating struggle over the disposal of dredged and excavated material that caused the loss of some business for the port, which is treated in the next section of this chapter. The Port Authority had promised tenants who were questioning what kind of commitment to make to the New York-New Jersey harbor (as opposed to competing ports such as Halifax or Norfolk) that deeper channels for the larger container ships would be available on a timely basis. It could ill afford significant delays to starting this work, and yet it has been forced to face several potentially time-consuming obstacles of an environmental nature.

The construction would have a detrimental impact on some littoral habitats. The environmental impact statement for the 1999 Harbor Navigation Study recommended mitigating this through improvements to the marsh at Mariner's Harbor in northwestern Staten Island. Old Place Creek, a tributary of the Arthur Kill, was soon substituted for Mariner's Harbor and the environmental assessment that accompanied the limited reevaluation report in 2004 recommended work on approximately nine acres along this drainage. But early in 2005 the New York State Department of Environmental Conservation asked the district to stop pursuing mitigation at Old Place Creek because of prospective development at the site.

This created a problem because to stay on schedule the New York and New Jersey Harbor Deepening Project needed a workable mitigation plan in place. Ordinarily good environmental practice calls for mitigation in the same water body as the projected negative impact because this directly replaces lost value (in contrast, mitigation activities remote from the intrusion make a more indirect contribution), but in this case they took a regional approach, as suggested by the New York-New Jersey Harbor Estuary Program (HEP). The HEP was an initiative of the National Estuary Program created by the Environmental Protection Agency (EPA) in 1987, on which the district and the Department of Environmental Conservation were cooperating. Within the harbor estuary, Jamaica Bay had been identified by the U.S. Fish and Wildlife Service as a habitat deserving special protection, and the Department of Environmental Conservation recommended that the district look at the marsh islands in the bay as a potential mitigation site instead of Old Place Creek. These marsh islands, which are vital to Jamaica Bay's ecosystem, have been receding in recent years at a rate of approximately forty-four acres per year, meaning they will be gone in a few decades.

Replenishment of salt marsh with dredged sand at Elders Point Island, Jamaica Bay, New York in 2006

The district selected Elders Point Island as a suitable candidate for mitigation because of its location and the considerable extent of its marsh loss. It is relatively easy to reach, yet it is not so close to Kennedy Airport that the airport disrupts the island's ability to provide a productive habitat for a variety of fish and wildlife species. Birds on the island are also far enough distant from the airport that they do not interfere with airplane flight paths. The loss of marsh at Elders Point Island has been so extensive that what was once one island has become two separate islands connected by a mudflat whose combined acreage amounts to roughly 15 percent of the original island ís surface area. The district will pump roughly 270,000 cubic yards of sand that has been dredged from various channels in the harbor to restore the island to nearly half its original size. In March 2006 the district awarded a $13-million contract for the first phase of construction on what represents the first full-scale marsh island restoration project in Jamaica Bay.

A second notable problem was more complicated. Not long after release of the report on the New York and New Jersey Harbor Navigation Study in 1999, the district learned that the Harbor Deepening Project faced an air quality problem, as much because of where it was located as because of its own output of air pollutants. According to the terms of the Clean Air Act, when an area fails to meet federal standards for the presence of certain types of pollutants it is classified by the Environmental Protection Agency as a "non-attainment area." States with non-attainment areas within their boundaries must develop specific measures, known as the "state implementation plan" (SIP), for bringing the offending areas into compliance with the national standards. The Clean Air Act also includes a general conformity rule that prohibits federal actions from interfering with state implementation plans.

The Harbor Deepening Project fell within three non-attainment areas: "severe" for ozone; "moderate" for particulate matter less than ten microns in diameter; and "maintenance area" for carbon monoxide. A maintenance area is a formerly below-par zone that has reached a satisfactory level of cleanliness but requires monitoring to ensure it stays that way. Ozone (or more precisely its precursors, oxides of nitrogen and volatile organic compounds), particulate matter, and carbon monoxide are all emitted into the atmosphere by diesel-powered equipment such as the dredges and barges that were to be used in the Harbor Deepening Project.

Neither New Jersey nor New York had included the Harbor Deepening Project in their SIPs, nor could either state add the project's emissions to their plans without exceeding acceptable levels. The key to compliance is that acceptable levels have to be achieved in each year. Even though this project would have a net beneficial effect on air quality over the long term by improving the operational efficiency of the big container ships, it needed to maintain compliance on an annual basis. This left only one option. The district and the Port Authority had to find a way to reduce or offset emissions to a level where there would be no net increases in the non-attainment areas within which the project area was located. This would take time, the scarcest commodity in the program. The Kill van Kull deepening was already on an accelerated schedule to coordinate with the forty-foot deepening that was under way. The Port Authority was investigating handling the Port Jersey Channel deepening similarly. One of the principal justifications for the consolidation of the projects in 2002 had been to achieve efficiencies of this kind.

In October 2002 the district formed a regional air team, affectionately called "the RAT," with the Port Authority, the Environmental Protection Agency, and New York and New Jersey's respective environmental agencies. The New York City Department of Transportation also attended regularly, though it was not officially a team member. The team's primary purpose was to find the requisite offsets or emission reductions without delaying the design phase or postponing the eventual project start date. The RAT developed a unique conditional statement of conformity, that its members signed in April 2002, that enabled engineering to proceed by promising that the project would conform before construction began. This approach was justified by the overall duration of the projection. Since it was slated to take twelve years, it did not seem prudent to make a firm commitment to all abatement strategies in advance. The conditional conformity document contained a pledge that individual statements of conformity would be prepared prior to the onset of construction on every project element.

The conditional statement identified a number of possible strategies that could bring the project into compliance: real reductions in project emissions, for which there were no current technologies available, although there were some promising ones in the offing; offsetting project emissions, which meant finding compensatory reductions in emissions from sources elsewhere in the non-attainment area; purchase of credits from entities whose undertakings had reduced emissions by more than required; and, down the road, inclusion of the project in later SIPs of New York and/or New Jersey.

In December 2002, Corps headquarters accepted the district's recommendation that it should seek ways to offset the project's damage to air quality standards in much the same way it would try to mitigate wetlands destruction. This led to a careful consideration of air pollution by marine vessels and a secondary look at on-road vehicle emissions. Headquarters agreed with the district's suggestion that addressing air pollution of public/governmental vessels was preferable to focusing on privately-owned ships primarily because it would pose fewer contracting difficulties.

The "*Harbor Air Management Plan for the New York and New Jersey Harbor Deepening Project*" was issued in December 2003. Its major element involved retrofitting the engines of the Staten Island ferries, which offered the largest single opportunity to reduce emissions within the project area. By equipping the propulsion engines on some ferries in the fleet with catalytic converters and retrofitting the engines of others there would be a reduction in the release of nitrogen oxides, carbon monoxide, and volatile organic compounds. The plan also included re-powering some tugboats and making use of some previously purchased emission credits, but the ferry fleet retrofit, which the Port Authority financed, was its centerpiece; it allowed for a reduction in the emissions in the project by more than the amount the project would generate. For the speed with which this was achieved and for the imagination it involved, the district's team received an Army Corps of Engineers National Planning Achievement Award.

The Staten Island ferry en route across Upper New York Bay

Another potential delay arose in February 2004 because the Environmental Protection Agency (EPA) was considering extending the boundaries of the Diamond Shamrock Superfund Site to include Newark Bay. As a result the Occidental Chemical Corporation, Diamond's successor, agreed to fund a study of the extent of sediment contamination in the bay. The Natural Resources Defense Council and NY/NJ Baykeeper sued the Corps of Engineers alleging that the Harbor Deepening Project would interfere with the sediment testing. In 2005 the Corps submitted an environmental assessment which argued that the cumulative effect of their dredging would not adversely affect the EPA's testing program, a conclusion with which the EPA agreed. The environmental assessment also laid out a coordination process that would enable the Corps to work closely with the EPA and keep each agency well informed of the other's actions, so that each agency's programs "are not adversely affected" by the actions of the other. At the time of writing, litigation was still ongoing.

There are fifteen construction contracts planned in order to complete the New York and New Jersey Harbor Deepening Project. The first was awarded in March 2005 for the Kill van Kull, just before the Port Authority announced in May that the forty-five-foot channels leading into the port of New York and New Jersey were officially open. Dredging for this contract started west of the Bayonne bridge and will work east along the kill. The second contract, which is the first of two for the Ambrose Channel, was awarded in September 2005. This contract is for dredging sand from the western side of the Ambrose Channel, and when completed, will provide a one-way fifty-foot-deep channel to the rest of the project area. The sand from this project is intended for a variety of beneficial uses, notably at Liberty State Park, for capping at the Historic Area Remediation Site (described later in this chapter), and for the restoration of Elders Point Island. The current plan calls for the final portion, the Arthur Kill to Howland Hook segment, to be completed in 2012.

DREDGED MATERIALS DISPOSAL

Like many other New York District operations, disposing of dredged material became more complicated in the early 1970s as environmental consciousness rose, but even by this time it had already been a challenging problem for many years. Most harbors depend on dredging, but the port of New York and New Jersey presents some special management complexities, both technical and political. Besides its size and tidal intricacy, its channels are operated and maintained under some two dozen separate federal authorizations; their sanctioned depths vary from eight to fifty feet below the level of the average low tide. The harbor is covered by two states, many state and federal agencies plus the Port Authority of New York and New Jersey. Moreover, most of the harbor edges are fully developed, so local upland disposal of dredged material is difficult. Because alternatives to ocean disposal must be found for dredged material, it is difficult, and therefore expensive, to deal with. For all these reasons the story of the district's thirty-plus years of struggle over disposing of material dredged in navigation channels under its authority is quite complex.

The earliest dredged material was used as landfill. Much of the harbor's edge was augmented with dredged material. The current footprint of Manhattan Island, for example, is one-quarter landfill. One could argue that ocean dumping arose as an alternative to landfill. The Corps of Engineers (like everyone else) first deposited dredged material adjacent to its excavations. Gradually everyone learned to haul the sediment farther offshore. Around 1914 the New York Engineers, as they were then called, started using a dredged material disposal site located approximately seven miles east of Sandy Hook, New Jersey, twelve miles south of Rockaway, New York. This 2.2-nautical-square-mile area located at the apex of the bight, where the ocean floor is roughly ninety feet below the surface, received the official title of the New York Bight Dredged Material Disposal Site in 1977, but for most of its life it was known simply as the "mud dump." Between 1966 and 1976 an average of more than seven million cubic yards of dredged material was deposited each year at the mud dump site.

*The dredge **New York** and accompanying scow (at left) and drilling rigs (at right) at work in the Kill van Kull near the Bayonne Bridge, circa 2005*

HARS and the Mud Dump

In the early 1960s the district studied the feasibility of eliminating siltation in the Hudson River altogether. But to the disappointment of the Port Authority, which sponsored the study because of its concern that the rising cost of removing dredged material from piers and wharves would drive away riverfront industries, the district concluded in late 1965 that there was no practical way to achieve this. With no prospect of cutting off sediment at its source, the Port Authority had another proposal, which the Corps of Engineers ultimately implemented. It asked for permission to allow pier and slip owners to reduce their dredging costs by moving the sediment from their sites only as far as the middle of the navigation channel from where Corps dredges working the channels could pick it up and take it to the mud dump at federal expense.

Later in the 1960s criticism of ocean dumping began to mount, and discussion of the problem of dredged material disposal became entangled with other matters of ocean pollution, particularly the issue of sewage sludge disposal.

VOLUME OF DREDGED MATERIAL

A ship container of the type that would go on a truck bed or railroad car holds roughly 113 cubic yards of goods. 7,180,000 cubic yards of dredged material would fill roughly 54,000 forty-foot-long railroad box cars. Lined up end-to-end this goods train would be more than 400 miles long, or roughly the distance from Boston to Washington, D.C.

In 1970 a draft of a report prepared for the district suggested that dumping sewage sludge and dredged material off Ambrose Light, at the mud dump, had created a twenty-square-mile “dead sea” that was spreading toward the beaches of New York and New Jersey. The evocative notion of an encroaching dead sea captured the attention of press and politicians. The Food and Drug Administration recommended banning the harvesting of shell fish in all waters within a six-mile radius of the contaminated area. The report charged that dredged material was in some ways more damaging than sewage because the mostly organic sewage dispersed while the dredged material, which contained mostly industrial and inorganic contaminants, sat on the ocean bottom causing harm to benthic (bottom dwelling) organisms. New York Representative Richard Ottinger from Westchester County called on the administration of President Richard M. Nixon to order an immediate stop to dredging permits.

A final version of the district-sponsored study, the draft of which had ignited the controversy two years earlier, concluded in 1972 that the disposal of dredged material and sewage sludge had a “deleterious effect” on living organisms in the New York Bight. But the report also indicated that no one had any hard information on the impact of deep ocean dumping. Some sense of the frustration the district felt over the awkwardness of its position at this time can be gauged by what a district spokesman told a reporter in August 1971:

If you are going to say stop all dumping or take the material out a hundred miles, you have to have viable alternatives. Where would you place this dredged material if their barging was forbidden? We have no room in the wetlands, and, in any case, do you want to fill them? Can you build containment areas in the bays? Or will you just stop dredging and let the silt accumulate? What would happen to our port facilities then? It is a huge industry, a lifeline for the greater metropolitan area. Are you willing to sacrifice it?

Not only did the Clean Water Act and the Ocean Dumping Act necessitate an overhaul of the district's regulatory operation, as discussed in Chapter 4, the two laws combined to transform the dredged materials disposal issue. Section 404 of the Clean Water Act called on the Environmental Protection Agency (EPA) to adopt guidelines for ocean dumping sites that would minimize the negative effect on water quality, biota, and recreation. It further authorized the Corps of Engineers to issue permits for discharging dredged material or placing fill in navigable waters according to standards set by the EPA. The Ocean Dumping Act authorized the EPA to designate sanctioned ocean dumping sites and, with the Corps of Engineers, develop a permit program to regulate what went into them.

In order to avoid bringing harbor dredging to an immediate halt, the EPA issued interim designations nationwide, pending the preparation of full environmental impact statements on each site. Despite the overall thrust in these years for systematic approaches to problems, these discussions about site designations were mostly carried out independently of one another. The New York District promptly began working with the agency about designation of official dump sites in its region. But it was a difficult conversation because the district had the most contaminated inner harbor material in the country. It was also difficult because other districts had upland containment sites while New York had none. In the early 1970s New York was the only district dumping contaminated material in the ocean because it was the only district with no other options. (Non-aquatic dredged material dump sites have slowly disappeared in many other districts because coastal land has become so valuable and they are now dealing with issues the New York District faced decades ago.) In 1977, when 11.6 million cubic yards of dredged material were dumped in the New York Bight, the EPA, in effect, drew a box around the original mud dump and designated the area an interim ocean dredged material site.

The EPA's designation of the mud dump as an interim site was not welcomed by all interested parties. The New Jersey state legislature officially asked its New York counterpart to join it in a petition to Congress calling for a halt to dumping of dredged material in the bight, and instead to take the material to a site 106 miles out to sea. The New Jersey lawmakers also proposed to ask Congress to end ocean dumping of all dredged material by 1981.

In 1977 the Corps of Engineers issued the first edition of its "Green Book," for permit applicants and testing laboratories. It was a "how-to" manual that delineated which test results were required for ocean dumping permits. The district also began testing the material dredged from the federal navigation channels under its jurisdiction, and it tried to keep pace when the EPA required a controversial new bioaccumulation test in 1979 to determine if contaminants, such as the carcinogenic polychlorinated biphenyls (PCBs) long used in making electrical insulation, accumulated in the food chain.

The same year that the EPA introduced the bioaccumulation test, a seed planted by the district following the passage of the Ocean Dumping Act bore fruit. In an effort to look for alternatives to ocean dumping it had hired the MITRE Corporation, a Massachusetts-based think tank, to summarize all the available information on dredging options and alternatives. The research considered a wide range of possibilities. MITRE's analysts looked at halting or minimizing dredging, ocean disposal, upland disposal, beneficial uses, and treatment of contaminated material. The MITRE study concluded that treatment of contaminated material was not feasible, although technical and scientific advances have since made some treatment possible.

Despite these efforts, the National Wildlife Federation sued the district in 1978 for failing to comply with statutory and regulatory requirements in its own dumping as well as in issuing permits to other projects. It was a suit with national implications for the ocean dumping of dredged material, and strenuous efforts were made by both sides to settle the suit. A number of issues were resolved in negotiation. The district shortened the duration of its permits from ten years to three, which later became the national standard term for dumping permits. It also agreed to summarize relevant scientific data in its public notices, and staff members in the district's Dredged Material Management Section are now trained in technical writing for this purpose. Three complaints remained for the court: that the district was aggregating the results of bioassay tests in a way that downplayed the toxicity of dredged soil; that a 10 percent mortality rate was too high as a measure of a significant undesirable environmental effect; and that by treating individual ocean dumping projects as isolated ventures the district was avoiding the National Environmental Policy Act requirement to prepare environmental impact statements that address the cumulative effect of continual actions.

In 1981 the court upheld the district's testing standards and procedures, ruling in its favor on the first two points. But on the need for a comprehensive environmental impact statement the court ruled for the National Wildlife Federation. While the court did not set a deadline for the preparation of the environmental impact statement, it wrote that the district "should be in a position to comply expeditiously with this court's ruling." In response to the suit the district promptly began a Dredged Material Disposal Management Plan and started on the full environmental impact statement the court called for, which it released in 1983.

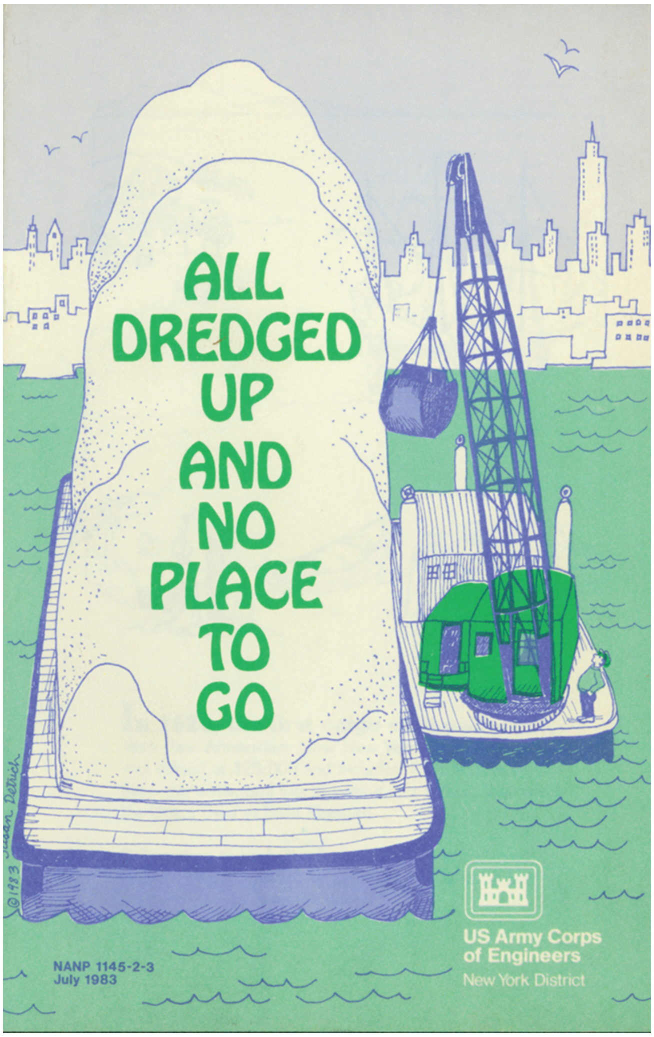
But a more serious problem was at hand. Despite the court's endorsement of the New York District's biological tests, the EPA and the Corps could not agree on bioaccumulation testing standards. With no consensus on how to test, dredging, for which there was a particular need at the Port Authority's passenger terminal on Manhattan's west side and at a few other areas, could not proceed. Parties whose businesses were threatened by the standstill launched a public relations campaign featuring the slogan, "because a worm died," which suggested that the business of the mighty harbor should not be stymied by an insignificant creature. In a high stakes gamble, the Port Authority notified the New York Passenger Ship Terminal Users Association that it could not assure adequate berthing depths for the Queen Elizabeth II and two other luxury liners scheduled to arrive in the spring. The move worked. Based on a study jointly undertaken by the district and Region II of the EPA, a toxicity standard was finally developed and dredging resumed. But the new standard was attacked by the National Wildlife Federation, which claimed it was below safety standards for PCBs and therefore posed a hazard to those who frequently ate seafood caught in the area. The Wildlife Federation complaint notwithstanding, the easier test was also just a temporary reprieve. The larger unresolved issues remained. How much PCB contamination was truly dangerous? How much would ocean dumping worsen the problem? What alternatives were there to ocean dumping?

The Manhattan passenger ship terminal on the west side of the Hudson River, circa 1995

The "Dredged Material Disposal Management Plan" was part of the district's response to the criticism that it had not adequately considered alternatives to ocean dumping. The plan's purpose was to investigate the best way to manage the ocean-eligible dredged material and come up with a feasible means of dealing with the rest. The plan created an interagency steering committee on which the district, as lead agency, was joined by the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service, the New York Department of Environmental Conservation, and the New Jersey Department of Environmental Protection.

The management plan included a Public Involvement Coordination Group (PICG), which was started around 1982 and lasted until 1990. It was an effort to bring interested parties from business and labor, environmental and civic organizations, elected officials, and others into the conversation about disposal of dredged materials. The PICG, which provided advice and guidance to the Steering Committee, was divided into various sub-groups: industry; labor; environmental groups; port interests; elected officials; and community groups. Each sub-group had a vice-chair who was responsible for trying to achieve consensus among their individual members on any given issue. The PICG as a whole also had a chair, whose responsibility was to try to achieve total group consensus on given issues.

The group distributed district publications aimed at increasing public awareness of dredging and disposal issues. Its bimonthly newsletter, *PICG Update* kept readers abreast of political developments and summarized the technical and scientific problems the steering committee faced in trying to responsibly dispose of dredged material. It was most effective as a forum through which a local community or special interest group could air its concerns and have a sense that it was being heard. When it was first announced there were 300 expressions of interest, but representatives of environmental groups drifted away from the PICG as the decade wore on.



The disposal plan included an important, if controversial, experiment that involved placing contaminated material in borrow pits and capping them with a layer of clean sand. The Natural Resources Protective Association, a Staten Island-based group of fishermen, objected to this, but preliminary results, analyzed in 1987, suggested that, contrary to fears of the fishermen, there had been no extensive sediment movement in the area where seas had been rough even without the contribution of Hurricane Gloria crossing the mud dump site in 1985.

In 1984 the Environmental Protection Agency removed the mud dump's interim designation, making it an authorized dredged material ocean disposal site, but limiting its total lifetime volume to one hundred million cubic yards. With the volume of dredged material in the years 1979 through 1985 averaging roughly seven million cubic yards per year, the site would not be available indefinitely, and the EPA began a supplemental environmental impact statement on a possible expansion of the mud dump. Roughly 95 percent of the dredged material from the New York-New Jersey harbor met then current standards for unrestricted disposal. But this still left roughly 350,000 cubic yards of contaminated sand, mud, and gravel to dispose of somehow, somewhere, each year.

One means of handling the massive volume of dredged material that grew in importance in these years was putting it to beneficial uses. At a national workshop in 1986 a number of district beneficial use programs were featured. Material dredged from the Ambrose Channel was used in four ways: for beach nourishment; in concrete manufacture; as structural fill; and for capping of contaminated material. The concrete use was particularly

Dredged material being used to cap a brownfield in Bayonne, New Jersey, circa 2000 notable. A producer of construction aggregate purchased one million cubic yards of sand a year for ten years. This both saved money and took volume out of the disposal stream. Other beneficial use projects included: the capping of the enormous Fresh Kills landfill on Staten Island; the subaqueous (below water) borrow pit experiment in the lower bay; and the building of underwater berms to slow erosion at Gilgo Beach on Long Island's south shore. A few years later, when beneficial use became an unofficial Corps of Engineers policy, it was easy for the district to embrace something it had been doing for some time.

When the Water Resources Development Act of 1986 authorized the deepening of the Kill van Kull, Newark Bay, the Arthur Kill and other channels it propelled the dredging and dumping issue back into the local news. The legislation's impact on the dredging question in the district was huge. Not only would the annual volume of dredged material increase by an estimated four times as a result of the channel modification projects it authorized; the bill also mandated the EPA to designate, within three years, an alternative site to the mud dump no less than twenty miles from shore to which only clean material would be taken. Two years later the hunt for a new site was "muddling along" according to *The Record*, a northern New Jersey newspaper, and finger pointing over who was to blame for the delay took place between the EPA and New Jersey Representative James Florio. The EPA said the designation was still at least three years away because, although the work had been authorized, Congress never appropriated money for it. Florio said the money was there, but the agency never asked for it. Regardless of blame, the EPA did not start looking for an alternative to the mud dump site until 1987 when funds from a discontinued program were reallocated for this purpose.

A national Memorandum of Understanding signed in July 1987 between the Environmental Protection Agency and the Corps of Engineers preserved the *status quo* in regard to the division of labor between the New York District and Region II of the EPA. The district continued to process applications for permits to transport dredged material to the mud dump. Region II held veto power over district decisions because it reviewed the applications for their compliance with the EPA's ocean dumping criteria. For the most part, the two agencies worked together. They developed a long range plan for monitoring the mud dump site, including its annual dumping schedule.

The district knew that the moment was not far off when the mud dump site would be closed to contaminated material. Since alternatives would soon be needed, the district hoped to revive its earlier experiment on one of the most promising alternatives, the use of subaqueous (below water) borrow pits. Left behind by previous sand mining operations there were roughly two dozen of these trenches in the harbor, ranging from twenty to seventy feet below the surface. The district wanted to conduct a test by filling seven of them with material contaminated by heavy metals such as cadmium, PCBs, and petroleum products and then capping the filled depressions with a three-foot-deep layer of clean sand. With this in mind, the district sent out 1,800 notices to public officials, local governments, community organizations, and the press. But the timing was not auspicious. The district's prospective experiment got caught up in a controversy that was technically unrelated to it, but seemed linked in the public mind, and as a result the district was unable to get its message across.

During the summer of 1988 hypodermic syringes and other medical waste began washing up on beaches in New Jersey and on Long Island. From Connecticut to Maryland officials were forced to close beaches due to various contamination problems, and ocean pollution became the hottest political issue of the day on the East Coast. Both major party Presidential candidates, Democrat Michael Dukakis and Republican Vice President George Bush made campaign visits to the New Jersey shore that summer. During his visit the Vice President called for a complete ban on ocean dumping. Similar to twenty years earlier, separable concerns were combined into one general uproar. Thousands of petitions, hundreds of angry opponents at public hearings, and many critical public statements greeted the district's proposed experiment, and it was unable to allay public fears with reasonable explanations. While the district had to concede that the toxins in question did kill fish, particularly bottom feeders, and that they did accumulate in the tissue of shellfish, it tried to explain that the toxins were present in this contaminated material at levels below those scientifically established as dangerous. Furthermore the district maintained that the experiment involved only a tiny percentage of the total amount of pollutants coming down the Hudson, Passaic, and Hackensack rivers, and that in any event this experiment was not actually adding pollutants to the water because the material was already on the bottom of the bay. In fact, burying it in these old underwater ditches under a clean cover would actually be safer than leaving it *in situ* on the bottom. But it was difficult to sway public opinion with this sort of pertinent engineering information during that hot and difficult summer.

In 1989 the district released "*Managing Dredged Material,*" a report prepared by a team from New York University. A follow-up to the MITRE Corporation report, this document provided a careful evaluation of the various alternatives that were available for material that was too contaminated for ocean disposal. Its conclusions were in line with what was already generally known. The vast majority of the dredged material posed no threat to the ecosystem of the New York Bight. For the small percentage that was unsafe the study identified the few available options: subaqueous borrow pits; large containment islands; upland disposal, either confined or as sanitary landfill cover; ocean disposal, with capping for low level contaminated materials; beach nourishment; and wetlands creation. This dredged material management report put, or should have put, potential non-federal sponsors on notice that disposing of dredged material was likely to get more expensive in the not-too-distant future. But with no crisis looming, little notice was taken of the implications of the plan.

A dredge at work loading a barge in the New York-New Jersey harbor, circa 2000

Later the same year a draft environmental impact statement concluded that borrow pits were the best alternative. Existing pits had the capacity to receive twenty-nine million cubic yards of material. Filling and then capping them with clean sand would isolate the contaminated sand from the marine ecosystem and improve the bay by returning the bottom to its earlier contours. The final environmental impact statement identified four existing pits that could be used, and identified locations where two new ones could be dug. The analysis concluded that digging new pits would probably have slightly less long-term impact than using existing borrow pits, but it would take several years to plan, design, and dig the new pits. The recommendation was, therefore, to use existing pits for the immediate containment of contaminated materials while new pits were dug for future use. Existing pits would require monitoring to be sure they were containing the contaminants of concern. The district, however, was not able to overcome all public opposition to borrow pits, and in the New York-New Jersey harbor a sound technical solution remains unimplemented.

In 1990 testing procedures for mercury, cadmium, and PCBs were slowly becoming standardized as agreement was reached on what levels of toxicity were acceptable. The district knew it faced difficult challenges ahead, but it had reason to believe that the interested parties understood what was at stake and that the consensus that seemed to be emerging on disposal options would strengthen. However, this was before the specter of the Vietnam War, which had been over for more than a decade, raised its head in the Passaic River in the late 1980s. Upwards of ten million gallons of the herbicide known as Agent Orange, for the color of a stripe on its containers, were used to defoliate forests in Vietnam, Laos, and Cambodia between 1965 and 1971 in a military strategy known as “territory denial,” which involved removing leaves and other plant life that might afford cover to enemy forces. Agent Orange, which also had peaceful agricultural uses, was manufactured by the Diamond Shamrock Corporation (now a subsidiary of Valero Energy Corporation) at a factory on the Passaic River in Newark from the early 1950s until 1969. When dioxin, a byproduct of the manufacture of Agent Orange, was found in bay crabs just down river from the abandoned plant it was added to the Environmental Protection Agency’s list of contaminants of interest.

This might not have had much bearing on the matter of how to dispose of material dredged from the New York-New Jersey harbor, but in early 1990 small amounts of dioxin were found along a seven-mile stretch of berths at the Port Newark/Elizabeth marine terminal complex, where the Port Authority was preparing to deepen half of its sixty-five berths to forty-two feet. All observers assumed the source was the Diamond Shamrock plant. Dioxin, which some scientists consider second in toxicity only to radioactive waste, was familiar to many because it had been the culprit in the best-known environmental tragedy of the era: Love Canal, near Buffalo. The implications of this discovery for the orderly removal of dredged material from the New York-New Jersey harbor may not have been immediately apparent, but combined with a revision in the EPA's rule book in December 1991, it led to years of delay, which district personnel came to call "Mud Lock."

It was not merely that the EPA added dioxin to its list of compounds of interest, because it is usually general toxicity level rather than the presence of a single contaminant that is the issue; it was also how much more stringent the testing standards became. When hard shell clams were used in general toxicity tests, as they had been in the 1980s, fewer than 5 percent of the samples failed. But the EPA decided that clams were too hardy. According to the EPA's legislative mandate its tests must be in line with advancing scientific practice, and nationally it began using more sensitive bottom dwelling organisms as a yardstick for its toxicity tests. When these organisms were exposed to mud samples from the Port Authority's proposed dredge sites, two-thirds of them died. Meanwhile, the question of how this contaminated matter should be disposed of loomed very large for the future of the harbor.

The response to the problem this time was different than it had been previously in similar situations. There was no more "on account of a worm" condescension about the issue. Instead, it was treated as "another ecology-economy" trade off, as a *New York Times* writer put it. No newspaper editorialized about how "petty environmental rules and legal stalling can jeopardize a development of enormous public value," as a New York official had responded during the Westway case treated in Chapter 4. Instead, *The Record* wrote of "one of those increasingly familiar dilemmas where the health of the region's economy must be weighed against the less tangible but equally important health of the region's population." Observers' ability to see both sides of the problem did not diminish its severity. The harbor was filling with silt and heavily laden ships were rerouting to other ports.

In early January 1993, after nearly three years of delay, the district issued a permit. A week later, a day before the dredging was to begin, the EPA withdrew its determination that the material to be dredged was suitable for ocean disposal because the district had allowed for dredging 500,000 cubic yards of material while the original April 1990 request from the Port Authority specified only 200,000 cubic yards. The district had permitted the larger volume to account for the additional siltation that had taken place during the two-and-a-half years the permit was under consideration. In February the EPA removed its objection to the permit allowing the Port Authority to dredge in twelve berths and continue testing to determine dioxin levels in twenty others, but the district said it wanted further testing even in the twelve to determine if dioxin levels in the sediment had risen since the last tests.

Finally, in late May 1993, almost thirty-eight months after it was requested, the district issued the Port Authority a permit to dredge 460,000 cubic yards of dioxin-contaminated sediment from thirty-nine of the sixty-five container ship berths in the Port Newark/Elizabeth marine terminal. The district characterized the permit as its "most stringent ever granted." Among its conditions: the sand cap must be placed within five days of dumping, and inspectors were to be on site to ensure that dumping halted if an endangered species of sea turtle or whale came near the site.

A judge to whom environmental groups appealed for a restraining order declined to stop the project because he considered it eligible for an economic hardship exception; but he did find flaws in the permit. Although federal law allowed the dumping of dioxin only in trace amounts of one part per trillion, the district had permitted up to ten parts per trillion. The judge gave the Port Authority fifteen days to either demonstrate that only trace elements of dioxin were being put in the ocean, or to apply to the Secretary of the Army for a hardship waiver. The judge may have been correct about the likelihood of the hardship argument prevailing. The International Longshoremen's Association reported that it had lost 100,000 hours of work the previous six months due to cargo diversions. With a protest flotilla of boats representing fishing and environmental groups in the Lower Bay, the contractor began dredging in early June. The skirmish was over but the larger struggle had not ended.

In June the New York District and the EPA hosted a dredged material management forum, in an effort to bring federal and state agencies together with environmental and business groups to consider practical alternatives to ocean dumping. The topics for discussion included containment islands, borrow pits, temporary storage, and new technologies for remediating contaminated sediment. A year later the forum reported a straw plan that involved tripling the mud dump in size and leaving it open to contaminated material for nine years while alternatives were investigated. It considered a two- or three-mile-long containment island similar to something built in the Chesapeake Bay as the leading alternative. District engineer Colonel Thomas York hailed the team effort involved and predicted there would be no more suits because of it.

In November 1993 while the forum was in progress, a barge hauling dredged material scraped against something at the mud dump site. It turned out to be a mound of material reaching to just twelve feet below the surface that contained roughly 1.2 million cubic yards of mud, sand, and rock. Piles of deposits were authorized to twenty-five feet below the ocean surface, but this one had continued to grow beyond its authorized height for two reasons: it consisted of more rock than usual due to the deepening projects under way, and the barges had been unusually accurate in dropping their material. Buoys were placed to mark the site, barges were required to take depth soundings after dumping their loads, and the pile's dismantlement began early in 1994, but not before environmentalists began calling it "Mount Spike."

Environmentalists were dissatisfied with the results of the dredged material management forum and in August 1994 the environmental group Clean Ocean Action went to the Third Circuit Court of Appeals arguing that the Port Authority permits should not have been granted, and that those still pending should be withheld. In fact Clean Ocean Action did catch the Environmental Protection Agency in a technical error. Amendments to the Ocean Dumping Act enacted in 1992 expanded the EPA's role in issuing permits for dumping dredged material, but the agency's new manual was inconsistent with the technicalities of the changed law. In June 1995 the court, which included future Supreme Court Justice Samuel Alito, Jr., ruled that while the regulations had been implemented incorrectly, "the extraordinary economic importance" of a functioning port "outweigh[ed] the minimal or nonexistent injuries to the appellants."

Meanwhile, pressure was being applied on the Port Authority from many directions. Not only were shippers diverting cargo, but political leaders in New York City were anxious to get the long-dormant terminal at Howland Hook in Staten Island back into operation. However, when the district proposed first to put 150,000 tons of contaminated sediment from Howland Hook in one borrow pit a half mile from Coney Island and then into another three miles from Staten Island, even supporters of the effort to make New York's ports more competitive with New Jersey's, such as Brooklyn Borough President Howard Golden, objected. To make matters more difficult, an experiment with putting sediment in a geo-textile bag failed when the bag holding 4,000 tons of clean material burst apart as it was dumped into the ocean. Ultimately the Howland Hook material was barged to Texas and then shipped by rail car to a hazardous materials facility in Utah, all at considerable expense. All involved parties recognized this was not the long-term solution to the problem of disposing of contaminated sediment from the New York-New Jersey harbor that was so sorely needed.

In December 1995 New Jersey Representative Robert Franks tried to help. If the survival of the multi-billion dollar port was not enough to get New York, New Jersey, the Environmental Protection Agency, the Corps of Engineers, environmental organizations, and other interested parties oriented toward a common goal, what about the Statue of Liberty? Franks held a press conference on Liberty Island to call attention to the need to dredge its ferry berths. "In as little as a year," Franks declared, visitors may be prevented from reaching "one of the great pillars of America."

While Franks's appearance at the Statue of Liberty did garner some publicity for the issue, the disposal situation remained at a serious impasse. All solutions were imperfect, and each had at least one powerful opponent. In 1995 less than half the annual accumulation of silt was cleared from harbor channels and berths. The district predicted, direly, that in 1996 only a third would be removed. Worse still, 90,000 containers were diverted from the port in 1996 and more than 125,000 in 1997. There was agreement on one matter. The days when it cost $5 a ton to barge sediment to the mud dump were long gone. The higher costs of any alternatives would need to be spread beyond harbor users to the beneficiaries of the prosperity it induced, such as the states of New York and New Jersey and New York City.

It took the intervention of Vice President Al Gore working with New Jersey Representatives Frank Pallone and Robert Menendez to break the "mud lock." The Vice President helped broker an arrangement among all the relevant parties that resulted in the final closure to contaminated material of the mud dump site. It also allowed the long-delayed dredging to go ahead, and got plans started on a mid-, if not long-range, solution to the problem of "protecting the ocean environment while ensuring the competitiveness of the Port of New York and New Jersey," as a July 1996 letter to several New Jersey Congressmen, signed by the EPA Administrator Carol Browner, Secretary of Transportation Federico F. Peña, and Secretary of the Army Togo D. West, Jr., put it.

The "Three Party Letter," as it was known, detailed an agreement between the Corps of Engineers, the EPA and the U.S. Department of Transportation that had three elements. First, the mud dump site would be closed to contaminated material on September 1, 1997, but until then contaminated material could be put at the mud dump from the various dredging projects that would be resuming. When the mud dump closed, a much larger area that encompassed it would be designated as the Historic Area Remediation Site (HARS). The HARS, roughly sixteen nautical square miles, would be remediated by capping it with clean dredged material.

The second part of the agreement pledged that the Clinton administration would expedite dredging in the harbor. It committed the EPA to two things: reducing from three to two the number of species it tested; and developing testing criteria that industry, labor, and environmental groups all agreed to and understood. The New York District for its part was to expedite the processing of dredging permits and ensure that maintenance dredging in ten high-priority federal navigation channels was completed before the end of 1997. The agreement was also predicated on the states of New York and New Jersey coming up with their $65-million share of the cost of the channel clearings, and on the assumption that there would be no more suits filed against the permits when they were issued.

The third part of the agreement committed the Clinton administration to ensuring the "health of the Port and the environment for the twenty first century." The Corps

Senator Frank Lautenburg, Vice President Al Gore, Representative Robert Menendez, and a representative of the International Longshoremen's Association watch over Robert E. Boyle, Executive Director of the Port Authority of New York and New Jersey (left) and Joseph W. Westphal, Assistant Secretary of the Army (Civil Works) (right) as they sign the "Three Party Letter" that ended the dredging impasse in 1996

would study deepening the main channels to fifty feet and beyond. The administration would fund cost sharing for upland disposal alternatives. The EPA would work on pollution reduction in the Arthur Kill and coordinate this activity with the Harbor Estuary Program's Comprehensive Conservation and Management Plan (a document that is discussed in more detail in Chapter 8).

Most environmental organizations and many regional political leaders hailed the agreement as a breakthrough, and it was. But sobering problems remained. Of the more than fifty disposal options identified in a district report, most were not politically realistic. For every successful upland use of the contaminated material two or three disposal options were beaten back by a fearful public. The explanation that low-level contaminants were safe on land but not in water because on land they did not make their way into organisms at the bottom of the food chain did not persuade many people. On the one hand, harbor sediment was used to underlay the parking lot and foundations at Jersey Gardens and an outlet shopping mall in Elizabeth, and to cap a landfill on which a golf course was built in Bayonne. On the other hand, local opposition blocked district efforts to use borrow pits off Staten Island, to fill an old quarry upriver in Hudson, New York, and to build a containment island in Sandy Hook Bay.

The Three Party Letter called on the Corps and the EPA to work with relevant state and local governments on a "sound" Dredged Material Management Plan by September 1998. When the draft plan was released it expressed a "dual goal" of economics and ecology: to maximize and expand the use of the port, while also maintaining and enhancing the estuary in which the port is located. These two goals were presented as equal. The economics of a bustling port no longer superseded the environmentalism of a reviving estuary. Not only that, but the plan blurred the line between economic and environmental benefits:

Though the economic benefits justify dredging most waterways ... they do not tell the full story. There are other less tangible, but still meaningful, benefits to be derived from maintaining the Port .... A reduction in overall regional truck mileage, reduced air pollution, and less wear and tear on the infrastructure are some of the more direct benefits of a strong Port. Other environmental benefits can be gained by removing surface layers of contaminated sediments and preventing their uptake by aquatic organisms. In addition, increased use of dredged material to remediate or restore degraded upland and aquatic areas promises substantial additional environmental benefits.

The Three Party Letter was more tenuous than some observers may have realized. In January 2000 two members of Congress from New Jersey, Representative Frank J. Pallone, Jr. and Senator Robert Torricelli, forced a public hearing on a permit the district had issued for dredging work at the Brooklyn Marine Terminal. Thousands of dockworkers left work at midday to attend the afternoon hearing held at Fort Monmouth. Because the animosity between the longshoremen and the ocean dumping opponents created an atmosphere in which there were genuine fears of physical violence, the meeting was ended before many groups and individuals had a chance to speak. At the hearing Representative Pallone accused the district and the EPA of "bureaucratic hogwash," and the President of the New Jersey branch of the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) told Pallone his political career was finished. A spokesman for a coalition of supporters of harbor development who had not gotten to speak warned in his written testimony of risks of job and business losses if the agreement collapsed.

Another shaky moment came in 2002 when the United States Gypsum Company sued the Corps of Engineers, the Environmental Protection Agency, and Clean Ocean Action over a memorandum of understanding they had reached. Under the three party settlement, the groups had agreed to a number of environmental standards. For PCBs they lowered the standard of acceptability from 400 to 113 parts per billion. When a U.S. Gypsum project failed the test by just a few parts per billion, the company sued on the grounds that the standard was arbitrary and capricious. U.S. Gypsum argued that it had been arrived at informally rather than through the official rule-making process that should have been followed. This suit threatened to disrupt the delicate balance that had been achieved among all the parties, until an out-of-court settlement was reached in which the states of New York and New Jersey, and the Port Authority, agreed to help U.S. Gypsum with the increased cost of disposing of the material that had been deemed unsuitable for ocean disposal because it was over the 113 parts per billion standard.

The Water Resources Development Act of 1992 required the EPA and the Corps to develop a Site Management and Monitoring Plant (SMMP) for the Historic Area Remediation Site. The SMMP was released in the summer of 1997 with ten objectives, including: remediation of the HARS with at least a one-meter cap of clean sediment; preventing placement of the remediating material from having an adverse environmental impact; monitoring of the HARS; and enforcing compliance with the Ocean Dumping Act. Region II of the EPA and the district were also to annually evaluate the effectiveness of the HARS management plan based on the results of the ongoing monitoring.

The forthcoming version of the New York District's Dredged Material Management Plan attempts to identify and implement environmentally sound and economically feasible disposal options with an emphasis on the beneficial use of dredged material wherever possible. When a deepening project brings up rock it is generally sent to artificial reefs built to attract fish off the Long Island and New Jersey coasts. Most of the sediment taken from projects in the Lower Bay is sandy and suitable for beach replenishment. However, maintaining a "world class harbor estuary" in the New York-New Jersey harbor, the goal the district proclaimed in 2000 and enshrined in its three rings symbol, will require the removal of millions of cubic yards of silty clay sediment high in organic matter and containing elevated levels of containments, a substance that is sometimes described as black mayonnaise. In mid-2006, most material from maintenance dredging was not suitable for the Historic Area Remediation Site. The largest part of the sand, clay, and gravel collected from the channel deepening projects qualified, but there is always the prospect that the Environmental Protection Agency will further tighten its standards in the future (it has already done so once since the Three Party Agreement orchestrated by Vice President Gore), which could result in more sand being excluded. On this question, as on so many other dredging-related subjects, opinion divides on what the future holds. Some are hopeful that beneficial uses and other alternatives will be available for disposal of dredge material; others worry that a seemingly chronic environmental problem could turn acute at any moment.

DRIFT DEBRIS COLLECTION

The Corps of Engineers has been collecting floating debris that might impede navigation for ninety years. Legislation in 1915, 1917, and 1930 variously authorized the Corps of Engineers to collect and remove drift from the New York-New Jersey harbor and its tributary waters. The gathering of flotsam and jetsam has not been particularly contentious; but the lack of controversy in the removal from the harbor of drifting material belies the operation's importance to the health of the harbor and the work of the New York District.

In the early 1970s the district had four ships patrolling for floating debris in the harbor, where two great historical forces were at work. On the one hand, the New York-

New Jersey harbor was declining as a center of industrial activity; on the other, the container shipping revolution was leading to the concentration of cargo handling facilities around its shores. For these two reasons the water's edge was dotted with unwanted and deteriorating ships and structures that produced floating remains as they broke apart. In the mid-1970s North Atlantic Division Engineer Major General Richard H. Groves identified an additional factor as contributing to the accumulation of debris in the harbor: a historical "use and abandon" attitude. General Groves felt that the port of New York and New Jersey was unique because of how locals tended to "use a dock or an area for a while and then when it becomes obsolete to leave it and move on."

Derelict vessels cheek by jowl in the Arthur Kill on Staten Island's west side, circa 1975

Drift debris, rotted piers and derelict vessels along the north shore of Staten Island at the entrance to the Arthur Kill, circa 1980

When the *Driftmaster* was constructed in 1948, to a New York District design, she was the first purpose-built, self-propelled drift collection vessel ever made. She held twenty-foot-square chain nets between her twin catamaran hulls. Each net collected seven to eight tons of debris during the course of the ship's routine trip of thirty-five harbor miles a day. For many years, the *Driftmaster* caught roughly half the harbor debris.

Another 30 percent was collected by the *Gorham*, which for roughly two-thirds of its time towed a catamaran-type collector barge that supported a net similar to those on the *Driftmaster*. On the barge, men with sixteen-foot

THE NEW YORK DISTRICT FLEET

The New York District fleet operates four larger vessels, along with a variety of smaller boats, in the maintenance and cleanup of the New York-New Jersey harbor.

- The ***Driftmaster***, sometimes described as the "doughty house-keeper of the harbor," has been plying district waters since 1948. She was the first craft ever designed for the purpose of harbor cleaning.

- The ***Hocking*** is the unofficial flagship of the district fleet. Named for William P. Hocking, a captain of the *Driftmaster* in the 1960s, she is used by the District Engineer and for the transportation of visiting dignitaries.

THE NEW YORK DISTRICT FLEET (CONTINUED)

- The ***Gelberman***, named for Jacob Gelberman, a former district operations head, replaced two smaller district vessels when she was launched in 1981.

- The ***Hayward***, the youngest and largest member of the district's drift collection fleet, was commissioned in 1975. She possesses a twenty-foot crane with an eighty-foot telescopic boom. Capable of carrying 1,000 cubic feet of debris, the *Hayward* has recovered helicopters, barges, a house, and a seaplane, among other floatables.

poles directed the flow of drift into the net. When it was full, a derrick on the *Gorham* raised the net on to the deck. After two nets were filled the material was taken to an incinerator barge.

The remainder of the drift was collected by the *Stanwix*, a motor tender that towed a catamaran barge carrying one large net, or a drift collector barge without a net, and the *Daly*, a diesel tug that towed a flat drift barge alongside. The *Stanwix* and the *Daly* collected drift in shallow waters inaccessible to the *Driftmaster* and the *Gorham*. Of the four, only the *Driftmaster* remains in the district fleet today. The *Hayward* was commissioned to replace the *Gorham* in 1975, and the *Gelberman* replaced the *Daly* and the *Stanwix* in 1981.

The district's small fleet for some time had been unable to keep pace with collecting the roughly half a million cubic feet of debris that accumulates around the harbor each year. In 1963 nine recreational boats sank after colliding with drifting material and were just a part of the $8 million in damages, mostly to propellers and hulls, attributed to floating debris in the harbor that year. In the face of this, Congress authorized a five-year study of the feasibility of removing drift "at its source." As if in confirmation of the seriousness of the problem for the life of the harbor, in 1965, while the study was under way, a major powerboat race in the area was rerouted away from the lower harbor.

A district "Survey Report," released in 1968, identified twenty-nine million cubic feet of potential floating debris from three principal sources. This study inventoried nearly 2,000 derelict vessels of almost every imaginable type, among them barges, scows, schooners, launches, tugs, lighters, tankers, patrol boats, marine derricks, dredges, and pile drivers. It found 331 completely or partially dilapidated piers, wharves, pilings, and jetties containing an estimated nineteen million cubic feet of wood. A third debris source was identified as roughly a million cubic feet of loose drift lying along the shorelines. The dilapidated piers and rotting hulls were everywhere in the region. The Arthur Kill, the Kill van Kull, the Hackensack and Passaic rivers, and other New Jersey locations probably contained about 60 percent of them. Debris was also found in several New York locations, including the East River, Newtown Creek in Queens, the Gowanus Canal in Brooklyn, Jamaica Bay, Manhasset Bay in Nassau County, and the shores of Staten Island.

Based on this inventory the district outlined an ambitious eight-year, $29-million plan to eliminate the debris by removing and disposing of derelict vessels, deteriorated shore structures, and scattered debris along the margins of the harbor. The old hulks would be cut into manageable pieces, the structures demolished, and the piles removed by complete extraction. Disposal was the bigger problem. The study team could identify no suitable landfill locations. Incineration of debris in barges off Caven Point was still under way, but its contribution to air pollution was coming under fire from many quarters.

WHALE REMOVAL

Besides the usual sources of man-made debris, New York District vessels are occasionally required to remove more exotic forms of debris source such as whale carcasses. In 1995 the *Driftmaster* brought a twenty-six-foot-long minke whale to Caven Point; in 1998 its crew pulled a fifty-one-foot-long fin (or finback) whale from Newark Bay.

In the three-month period from December 2000 through February 2001 the *Hayward* picked up three whale carcasses. In December 2000 the crew spotted a dead, forty-foot-long fin whale floating between Brooklyn and Staten Island. The next month the remains of a sixty-foot-long finback were found near Bayonne; and in February 2001 a forty-seven-foot-long fin whale carcass was pulled from the waters off Port Elizabeth. In each case, the dead mammals were towed to Caven Point where autopsies were carried out by biologists from the Marine Mammal Stranding Center in Brigantine, New Jersey, prior to the whales' offshore disposal.

In 2001 the district lifted five whale carcasses. 2001 was unusually hazardous for whales because they were following their food sources into waters that lay atypically close to shore. It is hypothesized that some carcasses became trapped by the water pressure in front of large vessels traveling at open ocean speeds; they were subsequently released when ships neared the harbor and reduced their speed.

The only long-term option was to load the debris on to barges, and haul it to a location in the ocean twenty miles southeast of the mouth of the harbor where purpose-designed burning barges were lit and towed in several-mile-diameter circles to disperse the smoke. The price tag, not quite a quarter of which would be paid by non-federal interests, was offset by an annual economic benefit estimated at more than $10 million whose elements included reduced damage to commercial and pleasure vessels, reduced fire and health hazards, increased navigational safety, and possibly an upswing in riparian land values. One possible beneficial use was not factored into the plan because it arose too late for the district's consideration. Roughly simultaneous to the release of the debris collection report, a local contractor demonstrated the possibility of converting some of the debris to wood chips, pallets, and even rough lumber. This effort, however, came to naught. Though it may have been technically feasible, it proved unprofitable without public subsidies that were not forthcoming.

In 1971 the district cooperated with an innovative task force established by the United States Attorney for New Jersey, Herbert J. Stern. Using reports from the district, Stern's staff hoped to employ seldom-enforced provisions of the Rivers and Harbors Act of 1899 to pressure responsible parties to undertake cleanup efforts. This tactic seemed necessary to Stern because no assertive cleanup activities had begun. An authorization in the Rivers and Harbors Act of 1970 for the New York Harbor Collection and Removal of Drift project that would have given the district some enforcement capability had not been implemented because there was no non-federal sponsor willing to share costs. Finally, the Water Resources Development Act of 1974 authorized up to $14 million for the project, although, based on two subsequent revisions of the survey report, the precise count of abandoned boats and decaying piers changed and the overall project cost estimate more than doubled to $60 million. Even before the work got under way the district displayed its pride in the forthcoming effort with an exhibit about it at a major boat show at the New York Coliseum in January 1975.

In December 1975 the district recommended an incremental approach to the drift debris collection problem. Liberty State Park, on the Jersey City waterfront west of the Statue of Liberty, was identified as the first priority. Following a long campaign by engaged citizens, New Jersey was developing an urban waterfront park on an area of decaying open space, marsh, and landfill. The first four drift removal contracts worth $9 million were awarded between June 1976 and June 1978; they all went to Liberty State Park for a cleanup effort that did not involve toxic or hazardous waste. Rather, drift debris, garbage, rotted bulkheads and the like were physically removed from the area. Nor was this the district's only contribution to New Jersey's effort to reclaim Jersey City's dilapidated waterfront. By reconstructing the Liberty State Park shoreline it consolidated the earlier removal work. Under authorization of the Water Resources Development Act of 1976 (WRDA76), and later through the related supplemental appropriation of 1985, the district built a crescent-shaped combination of rock-faced levees and pile-supported walkways that stretched for a mile and a half from the Black Tom Channel to just south of the Central New Jersey Railroad Terminal.

The magnitude of the effort to dismantle and discard potential sources of debris throughout the harbor is reflected in the steady escalation of its estimated cost. WRDA76 raised the federal cost limit to $28.7 million. In early 1978 the total estimated project cost reached $82 million, with a federal contribution of $39.7 million. In September 1986, the overall project cost estimate reached $130 million.

The Jersey City waterfront at Liberty State Park before cleanup of debris, circa 1975

The Jersey City waterfront at Liberty State Park after cleanup of debris, circa 1985

In May 1981 only the four Liberty State Park contracts and one East River contract had been awarded. Authorized projects at Gowanus Creek in Brooklyn and Shooter's Island in Lower Newark Bay, foundered for lack of local sponsors. *Driftmaster* Captain Frank Kuszelewicz thought he detected some improvement nevertheless. He reported that he was filling his ship's two nets twice daily rather than three times, as he had been doing a few years earlier. But there was still a lot of work to do. In 1979 the annual estimated volume of drift removed from the harbor was 600,000 cubic feet; and a district brochure in 1981 reported that an average of 17,000 vessels was damaged each year.

As the summer of 1982 approached an argument over the practice of debris burning erupted when the Director of Public Works for Asbury Park in Monmouth County, New Jersey, a coastal community roughly ten miles south of Sandy Hook, complained about charred timbers washing up on his beaches. He alleged that they had been dumped. The district and two private firms had the only EPA-issued permits for ocean burning, and the EPA defended its clients. Rather than dumping, a more likely explanation was that small explosions, which threw pieces of blazing wood into the water, sometimes occurred when the barges were ignited.

At the end of 1984, the district had issued eleven contracts worth nearly $19 million. Sixty percent of the funds were spent in Jersey City alone, and nearly 10 percent on East River work. Evidently more work was needed in the latter location, however. An experiment with ferry service between Brooklyn and Manhattan was forced to a halt in 1985 when the boat's propeller and shaft were damaged after it hit debris while crossing the East River.

The case of Shooter's Island provides a good illustration of how environmental considerations began working their way into district projects. Shooter's Island is a small island north of Staten Island at the confluence of Newark Bay, the Arthur Kill, and the Kill van Kull. Surrounded by the remains of a World War I-era shipbuilding industry, rotting barges, and piers, it had been authorized for removal by detonation as a navigation hazard, but the project was found not to be in the federal interest. In the mid-1980s, when the drift removal program looked at the island, it discovered that it was a rare undisturbed upland environment for wildlife, one of the largest uninhabited islands in the region. The debris that had collected around the island's perimeter was dense enough to form tidal pools, which were used as feeding areas by fish-eating birds that nested on the island. As a result, the district devised a plan to remove most of the debris, but leave enough in place to protect the wildlife habitat. However, one-third of the island belonged to New Jersey (divided between Elizabeth in Union County and Bayonne in Hudson County) and two-thirds belonged to Staten Island in New York; none of the landowning entities were willing to be the non-federal sponsor, and the project was not carried out. But it is no less a meaningful indicator of change.

The district was removing drift debris as rapidly as Congressional appropriations, local cooperation, and technical considerations would allow. The Water Resources Development Act of 1988 changed the federal cost allowance from a total ceiling to an annual limitation of $6 million. By August 1988 sixteen contracts totaling almost $37 million had been issued. Roughly three-quarters of the money went to New Jersey; more than 40 percent of the total to Hudson County.

These efforts did not insulate the district from its own collision with the wood, rubber, and medical waste afloat in harbor waters. In 1987 a twenty-mile stretch of beach in Ocean County, New Jersey, was closed for two days, and then a fifty-mile stretch in Ocean and Monmouth counties

Shooter's Island, at the confluence of Newark Bay, the Arthur Kill and the Kill van Kull, where a rich wildlife habitat has taken hold in amongst the drift debris, circa 1985 was closed for three days when debris washed up along the shore. The following summer there were more than 800 separate closing incidents along a seventy-mile stretch of Long Island's south shore. Shore visitation in New Jersey dropped by more than 20 percent from 1987 to 1988. Damage to the two states' coastal tourism economy was estimated at $2 billion over the two seasons. During that second season of floating debris washing up on beaches in New Jersey and on Long Island the district was among the agencies targeted by a group of protesters. In early September scores of boats – leisure craft, charter fishing rigs, giant tour boats, and others – gathered in New York harbor to protest ocean pollution. The action, which was organized by a coalition of environmental organizations that included Clean Ocean Action, Greenpeace, the New York Sportfishing Federation, and the Coalition to Cease Ocean Dumping, featured the boats sounding their horns as they cut broad circles around the Statue of Liberty.

This uproar conflated, as public outcries do, a number of separable issues, and it touched on but was not directly related to two district programs. The district was not responsible for picking up – to say nothing of causing – the medical waste, algae blooms, and fish kills that were the centers of concern, just as its dredged material disposal was less important to the ocean dumping issue than municipal waste was. Nonetheless, it cooperated with the EPA, the Coast Guard, and relevant agencies from New Jersey and New York on a "floatables action plan" put into effect in May 1989.

From experience, the district knew when to expect the largest hauls. They tended to come when heavy rains coincided with new or full moon-induced high tides to overload city storm drains. The plan defined a floatables season, from May 15 to September 15 – the period of heavy spring and summer rains – during which district boats were to catch the debris before it hit the shore. One veteran said the plan was to basically do more of what they were already doing. It involved helicopter surveillance by the Environmental Protection Agency and the New Jersey state police and an improved communications network, which included a number of twenty-four-hour hot lines. The $1-million-a-season plan used five district boats, two for reconnaissance and three for collecting debris, with crews doing extra cleanups during new and full moon tides and after heavy rains. It also involved emergency cleanups as necessary. By midsummer 1989, district vessels had collected 337 tons of floating debris; for the complete floatables season the total was 544 tons. This was more by weight (but not by volume) than in previous years. Ninety percent of the take was wood. Another 5 percent was tires and seaweed, while the remaining 5 percent comprised garbage and non-infectious medical debris such as oxygen masks, plastic gloves, and medicine bottles. Much of this smaller material was collected because the crews on the district's drift collection vessels had, on their own initiative, affixed fishing nets to the larger-mesh, heavier nets the ships were equipped with. This move, which went un-remarked upon at the time, represents something important about the staff of the New York District. Whether they are civil engineers or clerks, boat crew members or biologists, there is an attitude of: we've got a job to do and we will find a way to do it. When obstacles occur we will work our way through or around them.

After its first year the project was considered successful, though some scientists felt it hadn't really been tested. The difficulties of the previous seasons were caused respectively by an unusual pattern of persistent southerly winds that blew trash onto Long Island in 1988 and an even less common easterly wind pattern that pushed medical and household waste onto the New Jersey shore in 1987. Winds had varied enough in 1989 to keep most trash offshore, and until an unfavorable wind pattern returned it would be difficult to assess how well the plan was working. Some support for this view was provided the next summer. In mid-August 1990 a several-mile-long garbage slick in the upper harbor and several smaller ones in Newark and Raritan bays developed during a high tide that followed after a heavy rain. These slicks overwhelmed the district's capacity to contain or collect debris, and the material eventually washed ashore, forcing a beach closure. But at least the advance awareness of the slicks, and pre-planned computer modeling that accurately predicted where and when they would land, afforded beach operators a chance to be ready to clean up swiftly.

Some observers felt that after favorable wind direction, the most important factor in drift amelioration may not have been a part of the floatables action plan at all. They attributed more significance to the unilateral effort by the New York City Department of Sanitation to reduce the amount of waste material that escaped into the water as its garbage was barged to the Fresh Kills landfill on Staten Island. Whatever the reasons, the situation was improving. New Jersey beaches closed only twice in 1991. A comprehensive survey of New York harbor waterways commissioned by the city in 1995 found the harbor cleaner than it had been in years. Scientists from Cornell University identified the annual removal of several hundred tons of floating debris as the third most significant contributor to New York harbor's improving environmental health, after the expansion and upgrading of sewage treatment plants in the region (with which the district was involved as well), and the reduction in the amount of industrial waste discharged illegally. When this report was released, the district's New York Harbor Collection and Removal of Drift Project had issued nineteen contracts worth $44 million.

A garbage barge en route to the Fresh Kills landfill, circa 1990

In the summer of 1996 district drift removal crews were called on for a different kind of undertaking. On the night of July 17 TWA Flight 800 with 230 passengers and crew took off from Kennedy International Airport bound for Paris. Shortly after takeoff a fuel tank exploded for reasons never determined, though a build-up of fuel vapor in the central tanks became the prime suspect. The Boeing 747 shed pieces of its fuselage and cargo over a wide area before the fuselage plunged into the choppy sea about twenty miles southeast of East Moriches in Suffolk County, Long Island. There were no survivors. At the time of the accident the district's survey boat *Hudson* was moored that night at the Coast Guard Station at Shinnecock Inlet in the midst of a water quality test at Moriches Inlet. Hearing of a fire offshore, the *Hudson* headed toward it without waiting for an order. While proceeding on its way toward the crash site the ship's engine briefly caught fire, probably because it had sucked jet fuel fumes into the engine room. The crew worked all night on the grisly task of collecting debris and human remains. The next day, as the *Hudson* completed the tests it had been running in the Inlet, the Coast Guard requested the assistance of the district's drift collection catamaran, the *Driftmaster*, because of its capacity to pick up large quantities of debris. She reached the crash site on July 19 and worked there without a break until July 27. The Federal Executive Board later honored the crews of both vessels for their work. The *Hudson*'s team won a valor award for the courage it displayed in a risky situation. The *Driftmaster*'s crew was recognized for teamwork.

AMERICAN AIRLINES FLIGHT 587

On November 12, 2001 American Airlines Flight 587 from New York to Santo Domingo in the Dominican Republic crashed into a residential neighborhood on Long Island soon after takeoff from John Fitzgerald Kennedy International Airport. Two-hundred-and-fifty-one passengers, nine crew members, and five people on the ground were killed. The plane broke up in the air and its vertical stabilizer and rudder were found a mile from the main wreckage site. They were retrieved from Jamaica Bay by the *Hayward*. Coming only two months after the Al Qaeda-planned attacks on the World Trade Center and the Pentagon, speculation focused immediately on terrorism. The National Transportation Safety Board concluded, however, that the probable cause of the crash was that the vertical stabilizer separated from the plane in flight due to overuse of the rudder pedal by the pilot. At least one survivor of the World Trade Center collapse died on the flight.

The district's awarding of new contracts for collecting debris slowed in the late 1990s. Two contracts were awarded in 1998 – a sizeable one in Brooklyn and a very small one in the Passaic River – and the work was completed on each. No contracts have been awarded subsequently, for several reasons. The program became a lower priority in Washington when the emphasis in the harbor shifted toward the deepening projects, which require massive federal expenditures. To some degree the incentive to clear these debris fields was reduced as their importance as wildlife habitats, particularly for migratory birds, was recognized. In addition, non-federal public sponsors have not come forward to share the cost of drift collection. In New York, establishing effective cost sharing has been a recurring problem. In New Jersey, as the dilapidated factories of Hudson County were replaced with modern, high-rise office buildings and apartments, developers could include the price of cleaning up their waterfronts in their construction costs. The state and Hudson County lost interest, however, and federal cleanup efforts ended.

A total of $48.3 million was spent on the drift collection and removal project in slightly over three decades. Yet more, maybe much more, remains to be done. In mid-December 2004, a series of storms coincided with high tides to pull more than the usual amount of lumber and garbage into the water. The *Gelberman* had trouble keeping up. One day it took in 500 cubic yards of debris before lunch. District boats today still take in an average of almost one hundred tons per month, no great reduction from the amount they were collecting decades earlier.

There are a few factors that explain the seeming lack of progress after so much money was spent. In the first case the project all along was envisaged as slowing the rate of increase of drifting material. There was so much potential material in this large and complex harbor that it was simply not realistic to mount a program that would actually exceed the rate of deterioration.

Another contributing factor has more than a little irony attached to it. Piers and wharves actually last longer in polluted water than they do in clean water because pollution reduces the presence of a pair of marine borer organisms that have a large appetite for wood. Before the

*The crew of the **Gelberman** collecting debris in the harbor near the southern tip of Manhattan Island, circa 1995* harbor became heavily contaminated the life expectancy of a wooden pier or wharf was in the range of only fourteen to seventeen years. But when the waters were at their most polluted they lasted longer. Recently their pace of decay has picked up again. In 1995 some of the woody underpinnings of the Franklin D. Roosevelt East River Drive (commonly known as the FDR Drive) gave way, and in 1997 a group of people suddenly found themselves swimming in the East River when a pier at Greenpoint collapsed.

No one can foretell the future, of course, but the New York-New Jersey harbor region seems very likely to remain economically dynamic in the coming decades; and to a large degree the area's economic health will remain linked to commerce and navigation in the harbor. Because of the Corps of Engineers' responsibility for the federal channels in the harbor, the New York District's partnerships with the Port Authority, New York City, and the states of New York and New Jersey will remain vital to the area. The current harbor deepening work will take the district into the second decade of the twenty-first century, by which time new challenges will have arisen requiring a continuation of the technical expertise and creative energies of the Corps of Engineers.

MARINE BORERS AT WORK IN THE HARBOR

Two quite different marine boring species are the main culprits behind the decay of fixed wooden structures in the harbor. *Toredo*, commonly known as shipworms, are actually clams, i.e., elongated bivalves. They enter piers and ships timbers as miniscule larvae before taking on an adult form with shells that enclose only the front end of their bodies, which may reach as much as two feet in length. The shells function as augers rather than as protective covering, enabling these mollusks to burrow deeply into the wood that is both their home and their food supply. The other wood piling predator is *Limnoria*, an isopod crustacean seldom larger than a quarter of an inch. Also known as gribbles, *Limnoria* resemble wood lice with seven pairs of legs and four pairs of mouthparts. *Limnoria* can eat any wood that has not been penetrated by a preservative, including creosote-coated pilings. They attack in groups at or just below the water surface and can do great damage.

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Official New York District documents provided much of the project-specific data for this chapter. These included reconnaissance, feasibility, limited reevaluation, after-action, and other reports, engineering-design-documents, project management plans, and general design memoranda. While many of these public documents were found on the desks of district staff involved with successor or related projects, there were, at the time of writing, four principal locations within the Jacob K. Javits Federal Building where the majority of district reports were found: the libraries of the Engineering Division, the Planning Division, the Environmental Analysis Branch, and the Programs and Projects Management Division. Various iterations of the *Dredged Material Management Plan*, as well as many issues of the *PICG Update*, both kept in the Operations Support Branch, were a valuable source of information. Unofficial planning documents and other internal sources including draft reports were sometimes consulted as well. Most of these were gathered from individual staff members. Back issues of the *District Times* were often helpful. The important district documents for this chapter are listed below. All of the subjects treated in this chapter received attention from the *New York Times,* which was consulted via *Proquest Historical Newspapers* and *LexisNexis Academic*.

In addition to the sources mentioned above and listed below, oral history interviews contributed to this chapter as well. Samuel Tosi discussed the importance of the harbor to the district. Frank Santomauro, Eugene Brickman, William Slezak, Leonard Houston, and Thomas Creamer all discussed the related harbor deepening and dredged material disposal controversies. Thomas Creamer also described the drift debris disposal project. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Informal conversations with other current and former New York District employees were also informative about matters pertaining to the harbor. In particular, John Tavolaro discussed the dredged materials disposal controversy in detail.

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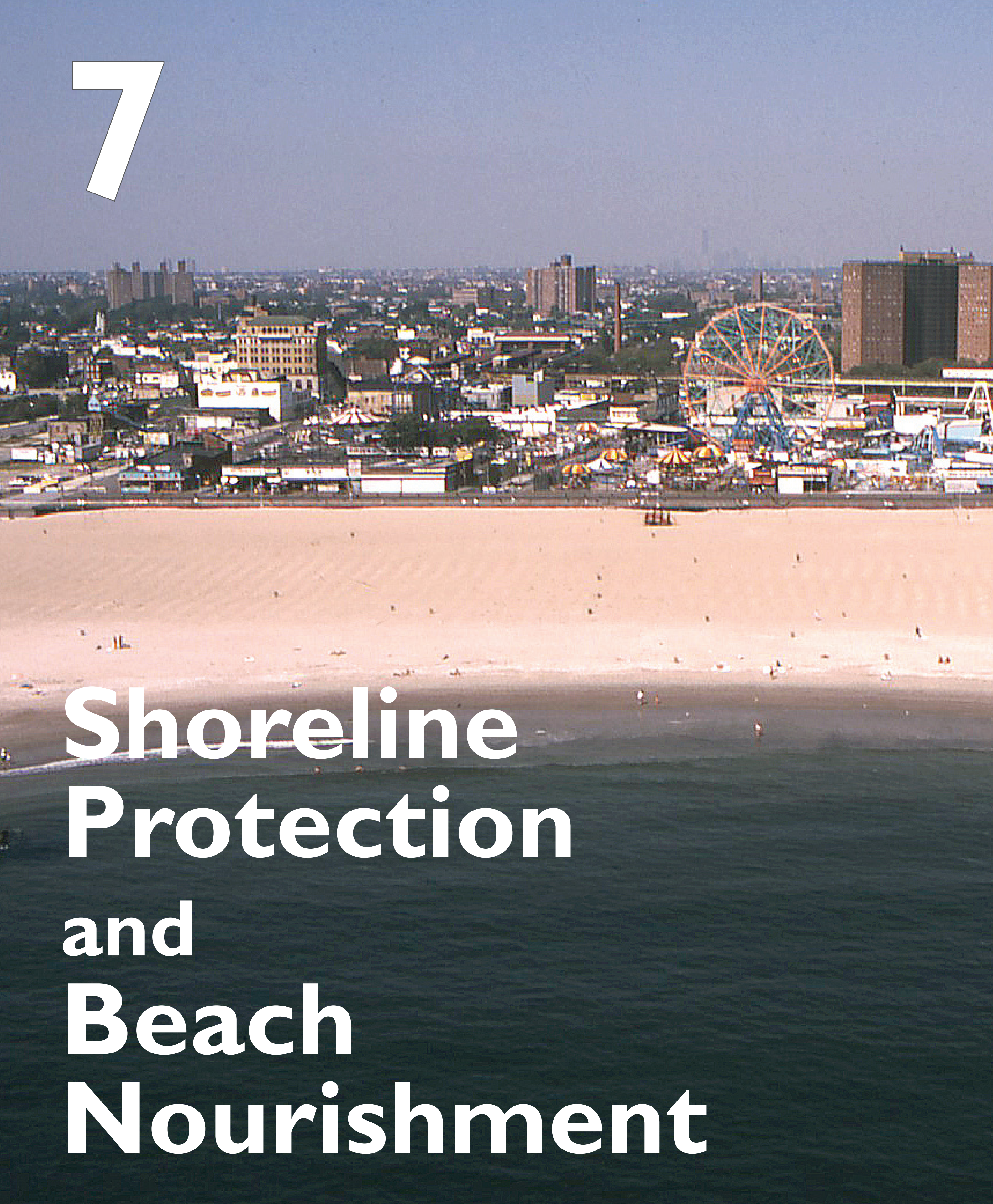

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Shoreline Protection and Beach Nourishment

The New York District's civil works boundaries comprise some of the most heavily used beaches in the United States, and many require frequent intervention to prevent serious erosion. The district includes both a major portion of New Jersey's heavily populated shoreline, where people have been trying to defend the coast from wave attack longer than anywhere else in the United States, and Coney Island, the site of the nation's first federally financed beach nourishment project. In the last few decades the evolving and technically complex field of coastal engineering has spurred a change in the district's approach to shoreline protection. In the 1970s the district's emphasis, Coney Island notwithstanding, was on "heavy armoring" (a term coastal engineers use to refer to structures such as sea walls, revetments, groins, and jetties) built to stop, absorb, or reflect wave energy before it reaches the shore. By the mid-1990s the preferred approach included less construction and more promotion of natural systems, such as salt marshes, along with the replenishment or nourishment of beaches with imported sand.

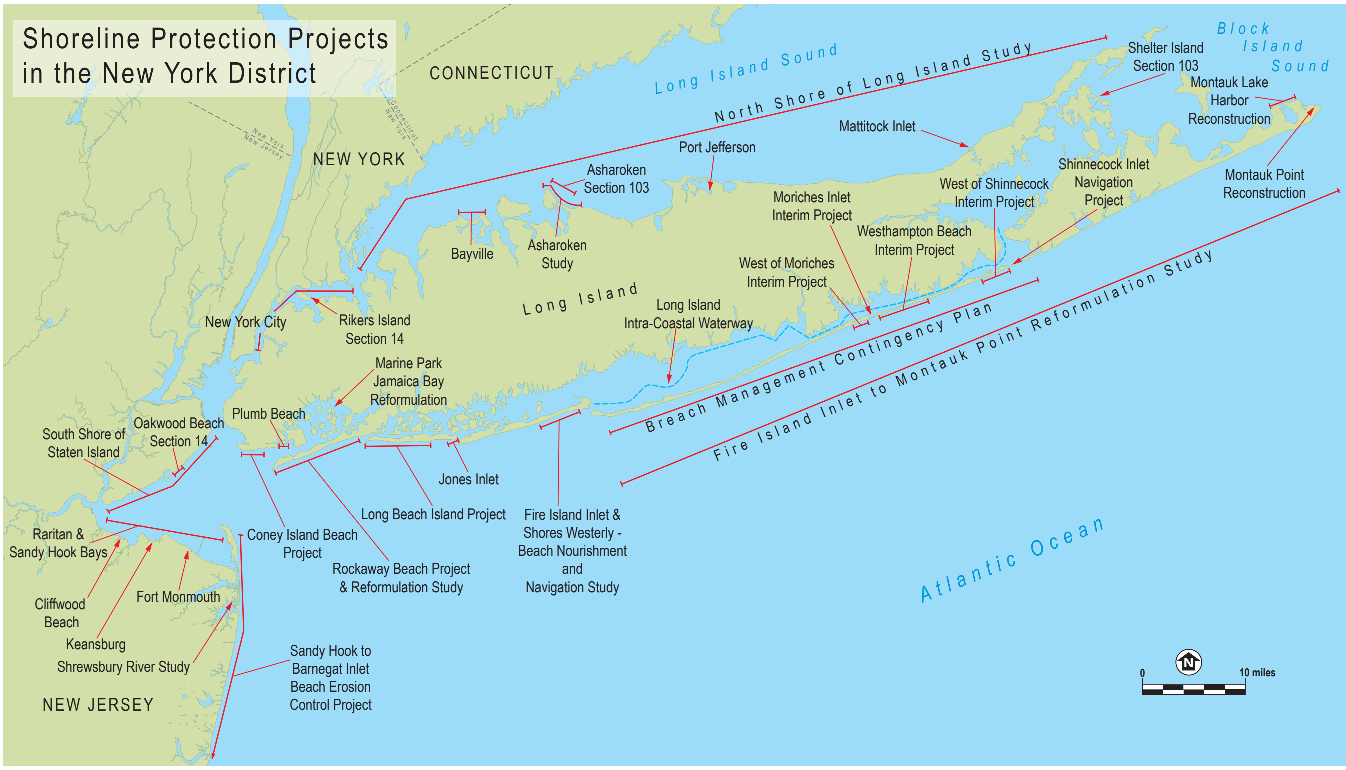
Amusement park at Coney Island, Brooklyn, New York

Much of the eastern seaboard of the United States is fronted by a discontinuous string of sandy, low-lying barrier islands, behind which lie an assortment of sounds, bays, and lagoons. Stretching from New England to the Gulf of Mexico the United States' Atlantic coastline contains the longest reach of such islands in the world. Barrier islands are dynamic structures that are formed by the interaction of tides, waves, currents, and wind. They are made up of various grades of sand, small stones, and shells. Barrier islands may be quite large, hosting fields of sand dunes and even maritime forests, or they may be mere strips of land with barely a ridge of sand. Whether large or small, barrier islands are fundamentally unstable. Their natural tendency is to migrate landward. They erode on the ocean side and grow in the bay, in effect rolling over on themselves in a manner that has been compared to the caterpillar treads on excavation equipment. Storms are the main short-term means by which this occurs. When storms surge, and waves wash over these islands, sand is carried from the ocean margin to the bayside, and when a barrier island is breached by the ocean subsequent high tides can carry considerable sand to the bayside as well.

Over a greater sweep of time there is a more important factor in barrier island formation than the action of storms and tides. The major long-term factor that contributes to the instability of barrier islands is the changing level of the sea. On a geological time scale of tens and hundreds of thousands of years, when the earth is cold, more of its surface water is locked in massive glaciers and ice sheets that cover the poles, and the sea level falls. When the earth warms, meltwater is released into the oceans and the sea level rises. The sea is currently rising at a rate of roughly one foot a century and scientific consensus suggests man-induced global warming is accelerating this trend. Sea level rise can only lead to more shore erosion problems in developed areas along the coast.

Compounding the problematic dynamic of a rising sea in contact with an unstable land mass, is the question of whether human intervention makes things better or worse – an issue on which there is no consensus. Two points, however, are not in doubt. First, any effort to stabilize a beach or inlet is a long-term commitment, and whatever one builds will need monitoring and maintenance. Moreover, there are so many variables involved it can be difficult to predict both how often beach nourishment will need to occur and how expensive the work will be. The other point on which there is agreement is that efforts to stabilize the shore in one location will have consequences elsewhere in the littoral system.

Congress gave the Corps of Engineers limited authority to study ways to protect the nation's beaches in 1930, expanding it in 1936. Federal participation in building shore protection projects was first authorized in 1946 when Congress set a federal cost contribution ceiling of one third for all beach erosion control projects on public property. Following the devastating wave of hurricanes in the mid-1950s (four hit the east coast in a thirteen-month period between the summer of 1954 and the fall of 1955), previously authorized studies of hurricane hazards were



expanded to cover beach damage as well. The Water Resources Development Act of 1986 authorized a federal beach replenishment project on Coney Island. Previously beach replenishment was ineligible for federal funds because it was considered to be maintenance as opposed to new construction.

The New York District's civil works boundaries contain hundreds of miles of coastlines that are heavily used for recreational and commercial purposes. A few stretches of coastline are treated in detail here: sections of the south and north shores of Long Island in New York State, and parts of the Atlantic, Sandy Hook and Raritan Bay shoreline in New Jersey.

LONG ISLAND OVERVIEW

Long Island is a long finger of land that extends east from Brooklyn and Queens in New York City for nearly 150 miles to Montauk Point. At more than 1,700 square miles, it is the largest island in the continental United States (and with more than 4.7 million people living in Brooklyn and Queens and other 2.8 million in Nassau and Suffolk counties, also among the most densely populated islands on the planet). Long Island was formed from the hodgepodge of till – sand, clay, gravel, and boulders – that was left behind during the final retreat of the Wisconsin ice sheet some 10,000 to 20,000 years ago. At the eastern end of the island this material was consolidated into cliffs, which have been surrendering dirt and rock to the pounding of the waves for roughly 6,000 years. Once thrown into the sea, the dirt and rock from these cliffs is ground into finer and finer sand by the relentless action of the surf. Long Island's magnificent beaches and its string of barrier islands (the Hamptons, Fire Island, and Jones Beach) and peninsulas (the Rockaways and Coney Island) consist of sand that is produced in this way and carried west by the currents of the Atlantic Ocean.

Over the past 5,000 years or so the barrier islands have formed and reformed in response to the constant churning in the ocean's shallow waters from one to ten miles offshore from Long Island's southern margin. As the huge breakers roll shoreward they scoop up material from the ocean floor; as they fall back they leave it behind in the form of sand bars. Gradually the sand bars, fed by the hundreds of millions of cubic yards of sand carried west by the longshore currents, have grown into a chain of elongated islets, which, in turn have joined together to form the current continuous beaches.

Barrier beaches breach and reconnect naturally. Indeed, while some geologists and historians believe the name "Fire Island" may come from the fiery red vegetated dunes that are visible for miles, others consider it a corruption of "five islands," which in the nineteenth century they were, before sand in the littoral system built up to connect them together. Although barrier islands are not stable, they do maintain a certain equilibrium between opposing natural forces. On the one hand, beaches are under constant attack from the tidal currents and massive storm surges of the Atlantic Ocean. On the other hand, they are built up by the deposits carried to the ocean front by the parallel longshore currents. Any sand that washes or blows across the barrier islands adds to the marshes that grow in the bays and lagoons behind them. As the sea level has risen over the past few millennia, and the shoreline has moved inland, the marshes have provided the base upon which new dunes grow.

Owners of shoreline property found ways to withstand the sea on a small scale for centuries, but as the beachfront population gradually increased, such efforts on the Long Island shore grew more ambitious. In 1931 a storm cut an inlet to Moriches Bay, located roughly halfway between Manhattan and Montauk. Left alone this breach would probably have closed, as others had over the years, but locals liked the access to the ocean that the opening provided, so jetties were built to secure it, blocking the westward flow of sand. Similarly, a massive hurricane in 1938 (still the storm of record on the eastern portion of the south shore of Long Island) opened Shinnecock Inlet between Moriches and Montauk. It was one of ten places where the Atlantic Ocean broke through to the bay during that storm. Nine were filled, some by natural means and some through artificial action by Suffolk County, but at Shinnecock authorities built a bulkhead nearly 1,500 feet long around the west shore of the inlet. These two actions at Moriches and Shinnecock set in motion a costly sequence of efforts, now three quarters of a century old, to hold in place the ocean front of Long Island.

Immediately after World War II, as the population on Long Island's south shore began to grow rapidly, New York State started matching local dollars spent on projects designed to arrest coastal erosion. By 1960 the state had built eleven groins, added more than six million cubic yards of sand, and planted more than 400 acres of dune grass at eleven locations between Fire Island and Montauk Point. It also built revetments and jetties at both Moriches and Shinnecock inlets, and it started looking to Congress for help protecting this valuable piece of the coast.

The New York District's enlistment in the war between sand and surf on the south shore of Long Island stems from the Congressional response to hurricanes Carol and Hazel, which hit the northeast in the late summer and fall of 1954. By this time the U.S. Army Corps of Engineers had been studying the problem of coastal erosion for a quarter of a century. Legislation in June of 1955 authorized studies of hurricanes along the eastern and southern seaboard whose aims included collecting data on "the behavior and frequency of hurricanes" in order to predict their occurrence better, and to determine the economic feasibility of preventing loss of life and property by building structures such as "breakwaters, seawalls, dikes, [and] dams." In February 1957 the district received the go-ahead for a Jones Inlet to Montauk Point study that had two elements. It combined an investigation of beach erosion control, on which the district had been cooperating with New York State since April 1955, with a hurricane study of the kind contemplated in the legislation of 1955. Ultimately this study led to the dividing of the Jones Inlet to Montauk Point stretch into five segments, the largest of which by far was the eighty-three-mile reach from Fire Island Inlet to Montauk Point.

SHORELINE STRUCTURES

Five main types of structures are used by the U.S. Army Corps of Engineers and others to reduce the amount of wave energy that reaches the shore. In most current Corps of Engineers projects sand provides the real beach protection, while hard structures are used to hold the sand and beach fill in place.

Bulkheads are essentially retaining walls that run parallel to the coastline, separating the land from the sea. Their primary purpose is usually to prevent sliding of the land or to resist other earth pressures. Protecting the upland against damage from wave action is generally secondary.

Groins are the most common coastal defense structure on the beaches in the New York District. Usually piles of rocks, though they are also made of wood or concrete, groins run perpendicular to the shoreline, extending out from the beach into the sea. Groins may be permeable or impermeable, and are usually built to trap littoral drift and retard erosion. They collect sand on their updrift sides with a corresponding loss of beach material on their downdrift sides.

Jetties, often confused with groins, are generally built in pairs at the mouth of a river or the entrance to a bay or lagoon. Jetties direct and confine the stream or tidal flow, prevent shoaling, help deepen and stabilize channels, and generally facilitate navigation.

Revetments are facings of stone or concrete built to protect an embankment, scarp, or shore structure against erosion by wave action or currents.

Seawalls are structures built along a portion of a coast primarily to prevent erosion or other damage by wave action. They retain earth against their shoreward face. Because they are larger, seawalls are generally capable of resisting greater wave forces than bulkheads.

FIRE ISLAND TO MONTAUK POINT

The New York District released a report entitled "*Atlantic Coast of Long Island, N.Y.: Fire Island Inlet to Montauk Point Cooperative Beach Erosion Control and Interim Hurricane Study (Survey)*" in July 1958. It recommended a dual-purpose plan for hurricane and shore protection that Congress duly authorized after revisions in May 1959 and February 1960. The plan would cost nearly $38.5 million (equivalent to roughly $250 million in 2005 dollars) and require about thirty-four million cubic yards of sand. (In 1977 the sand estimate was raised to 64.5 million cubic yards.) The plan's elements included: widening the barrier beaches along developed areas between Kismet and Mecox Bay to a minimum width of a hundred feet at an elevation of fourteen feet above mean sea level; raising dunes to an elevation of twenty feet above mean sea level from Fire Island Inlet to Hither Hills State Park, at Montauk Point, and opposite Lake Montauk harbor; planting grass on the dunes; the building of gated interior drainage structures at Mecox Bay, Sagaponack Lake and Georgica Pond; and possible future construction of up to fifty groins, if they were found to be warranted. New York State strongly urged the authorization of at least fifty groins.

The Fire Island to Montauk Point team divided the eighty-three miles under its purview into five reaches from west to east. Reach 1 stretched from Fire Island Inlet to Moriches Inlet; Reach 2, known as Westhampton Beach, ran from Moriches to Shinnecock Inlet; Reach 3 from Shinnecock to the east end of the barrier beach at Southampton; Reach 4 from Southampton to Beach Hampton; and Reach 5 from Beach Hampton to Montauk Point. Westhampton Beach, comparatively undeveloped, was identified as the highest priority because of its vulnerability and, at the request of New York State, work began first on a general design memorandum for this segment. While it was in preparation a strong northeaster, the "Ash Wednesday storm" battered Suffolk County in March 1962, destroying ninety-six homes in the Hamptons and on Fire Island, and inflicting an estimated $35 million in property damage (equivalent to almost $220 million in 2004 dollars). Fifty washovers occurred, a new inlet was formed at Westhampton Beach, and twelve square miles of the mainland were inundated. The storm prompted a range of responses.

Master planner Robert Moses was the first to wade in. In his capacity as the chairman of the Long Island State Park Commission he called for a measure he had advocated in 1938 after the hurricane that had opened Shinnecock Inlet, and again in 1944 after another destructive storm. His proposal was, in fact, a variation on the theme he had used to create Jones Beach State Park in 1926. For $50 million (equivalent to more than $300 million in 2004) he believed he could permanently solve the erosion problem on Long Island's south shore beaches by dredging a forty-mile-long channel in the Great South Bay, using the dredged material to erect an eighteen-foot-high "sand dike," and capping it with an ocean boulevard. Moses' plan also included funds to stabilize Shinnecock and Moriches inlets. Fire Island residents, normally eager for anything that protected them from the angry seas, bitterly opposed this idea because of the road. Moses defended it on three grounds: with so much public money being put toward the preservation of a beach, the public deserved a means of access to it; the road would hold the sand in place; and with a road built by state and federal funds, the respective state and federal entities would maintain it. Maintenance left to local authorities, in contrast, would be an uncertain proposition. In this proposal one can see the characteristic Moses approach to planning and public works: faith that man could beat nature; a canny political sense; and a belief in roads above all else. But the debate is germane today mostly because of the question of local follow-through.

Right behind Moses in responding to the storm came New Jersey senators Harrison Williams and Clifford Case. Their interest stemmed from similar coastal flooding problems in their state, which was also hit hard by the Ash Wednesday storm, and where a Congressionally authorized beach protection plan was stalled because of insufficient willingness to pay the state and local shares. Williams proposed looking anew at the creation of a federal flood insurance program, while Case proposed, with Williams's support, to sweeten the matching formulas in flood protection projects so that the state and local costs would be less. Perhaps with a more favorable funding formula New York State and Suffolk County would get the flood insurance program going.

The district's "General Design Memorandum No. 1," covering Reach 2, the portion of the project between Moriches and Shinnecock inlets, was approved by the Chief of Engineers in January 1964. Based on what New York State was willing to support, it recommended building thirteen groins (out of twenty-three authorized for this section), and filling the spaces between them with sand. These groins were designed to reinforce the fill placed in the groin compartments. They were not designed to trap littoral sediment in order to build up a beach; they were too high for that purpose.

What ensued is an oft-told tale. After further discussion with local interests the plan was reduced to eleven groins in this reach, two in Reach 4 (at Georgica Pond in East Hampton), and postponement of the hydraulic placement of fill until it could be determined how much accretion of sand occurred (with fill placement in any case to take place no sooner than three years after the groins were built). The district's proposal included building the groins starting at the jetty at Moriches Inlet, at the western or down-drift end of the project, and working to the east so the groins would catch sand after it had moved across Westhampton Beach. The press reported, however, that Suffolk County, responding to pressure from influential owners of property at the east end of the project area, insisted that it would not pay for its share of the project unless the work started at the east end.

On two grounds, then, the project was going contrary to what coastal engineers considered best practice. First, as a basic rule of beach replenishment, groin construction should not have preceded sand placement; and once the groins were built, the compartments between them needed to be filled with sand as soon as possible. Second, and no less important, such projects should always start at the furthest down-current end of the littoral drift. The district presented to New York State its concern that serious erosion could occur west of wherever the last groin stopped. But Congress had appropriated funds, and directed the district to build the project starting at the east end. In the finger pointing that ensued in later years, it was often overlooked that the Congressional appropriation represented a mandate to build.

In January 1965 the New York District began work on Westhampton Beach, and in October 1966 completed the eleventh groin, leaving a three-mile gap between the westernmost groin in the field and the jetty at Moriches Inlet. The results were as predicted: erosion west of the groin field intensified as soon as the first groin was built until, in 1967, the ocean overwashed into the bay and the district called for Suffolk County to fill the groin compartments because severe erosion would continue until "all compartments are filled." Despite the County's failure to add sand, the district prepared a quick supplement to the general design memorandum of 1964, and built four more groins in 1969. This brought the total number of groins in Reach 2 to fifteen and extended the groin field by a little over a mile. But this only moved the trouble spot further west. Between October 1969 and October 1970 nearly two million cubic yards of sand were placed on the beaches between the groins, which added some material to the westward littoral drift that the groins had interrupted, but the groins trapped most of this sand so it did not reach the nearly two-mile stretch of depleted beach east of Moriches Inlet. Shoreline erosion continued to accelerate there.

As erosion continued along this vulnerable reach, the district moved forward with plans for six additional groins to the west of the already constructed groin field. But in November 1971 New York State imposed a moratorium on capital projects that lasted until April 1973 when the state finally asked the district to resume planning for these six groins. Meanwhile a number of property owners west of the fifteenth groin filed suit. When Suffolk County objected to borrowing sand from either Moriches Bay or Moriches Inlet, New York State asked the district to investigate alternative sand sources and the district began looking

A groin at Westhampton Beach, Long Island, New York, circa 1975 at the possibility of borrowing ocean sand. In April 1978, New York State persuaded Suffolk County to participate again in a project that included both beach fill and dune construction. The district thus resumed work on a second supplement to the Westhampton Beach general design memorandum, and the parties to the 1973 suit seemed satisfied with the proposed work.

Another problem loomed. The Fire Island to Montauk Point project had been authorized before the National Environmental Policy Act (NEPA) requirement for an environmental impact statement (EIS) went into effect, but now an EIS would be necessary before construction could begin. The district began preparing the document promptly, but when it put its draft into circulation in the spring of 1976, the Department of the Interior noted a number of serious deficiencies. Interior felt the district had not collected enough data, had not given adequate consideration to alternatives, and had not assessed long- and short-term impacts fairly. When the district released the *Final Environmental Impact Statement for Fire Island to Montauk Point, New York Beach Erosion Control and Hurricane Protection Project* in September 1977, the Department of the Interior still found "no new significant information" in it.

District personnel joined the assistant directors of the U.S. Fish and Wildlife Service and the National Park Service (the two involved branches within the Department of the Interior), the Corps of Engineers' deputy director for civil works and members of his staff at a meeting in March 1978 at which a number of issues were worked out. Corps and Interior staff members agreed to work together on an environmentally sound plan that would conform to the spirit and intent of existing laws and executive policies such as the Carter administration's recently issued executive orders favoring non-structural flood control solutions. Despite the agreement, Interior referred the case to the Council on Environmental Quality because the project would irrevocably alter the ecosystem in the dunes along 70 percent of Long Island's coast resulting in the gradual loss of crucial wetlands in the bays.

The Council on Environmental Quality took on the case. It concluded that the New York District's environmental analysis had neither treated the entire Fire Island to Montauk Point reach as a complete system (as the 1958 plan had not) nor looked at a sufficiently wide range of alternatives. In June 1978 the Council recommended a complete project reformulation. Between September 1978 and January 1980 the district held public hearings and met with the relevant federal and state agencies to determine what work would be necessary for a reformulation study. A plan of study was agreed to in July 1980. The Council had also allowed for construction of interim projects in critical areas providing they were environmentally responsible "soft measures" that could be reversed if they turned out to be inconsistent with the overall reformulation effort. Based on this, the district resumed its planning for a supplement to the original general design memorandum for the six-groin effort, which came to be known as the Westhampton Interim Project.

In retrospect, the New York District had been trapped in an awkward situation. First, it had developed this plan more than a decade before NEPA, and it could not have been expected to anticipate the full force of this legislation. Second, while the U.S. Fish and Wildlife Service objected to the Fire Island to Montauk Point EIS in 1978 on environmental grounds, in the mid-1960s it had taken another view. The agency had raised some concerns about the project's impact on the fish and benthic organisms of the marshlands in the south bay area, but was quick also to detect a potential means of mitigating it. Although the groins would interrupt the natural overwash cycle of a barrier island, the enhanced fishing access they provided were viewed as offsetting any detrimental effects to marine life. Over the space of ten years, then, a governmental agency that had earlier been primarily a protector of fishermen and hunters had evolved into an agency whose mission was to protect the ecosystems in which fish and wildlife flourished.

It would not have been possible for the Corps of Engineers to transform itself as quickly because it retained missions to build shore and flood protection projects. There are only a few ways to deal with coastal erosion. If people are to continue living along the coast one can try to stabilize the beach with hard "armoring" solutions, such as seawalls and groins; or one can nourish and replenish the beaches. Alternatively, people can retreat from the coast and let nature take its course. The first two approaches can be combined to various degrees, and the district's approach to the south shore of Long Island included elements of both armoring and replenishment. The agencies of the Department of the Interior, consistent with their missions to protect various natural resources, were looking more at a human retreat from the coastline. Its submittal to the Council on Environmental Quality sought to "have the project revised to work with the natural barrier island evolution process." This was not an option open to the Corps because its mission remained to develop a project that protected the Fire Island to Montauk Point reach from storm damage in an economically cost-effective way.

In the early 1980s some Westhampton property owners to the east of the last groin were complaining about how far they had to walk from their homes to reach the ocean, while owners west of the fifteenth groin, on what they were calling "the bad side" of the groin field, were in deepening water. Their beach was starving even as newer bigger homes continued to be built, generally on wooden pilings because this qualified their owners for newly available federal flood insurance. Eight homes that washed into the sea during severe storms in January and February 1978 were rebuilt in the same locations with the aid of flood insurance. On the bayside, residents west of the latitude of the last groin were facing a different problem. As more and more sand-laden waves overwashed the narrowing island, these unfortunate homeowners were finding it increasingly difficult to keep sand out of their homes. In January 1980 the barrier island was breached roughly half a mile east of Moriches Inlet, and the breach was repaired under emergency procedures.

The interim project that the New York District developed in 1980 provided for beach fill and dune construction in and west of the groin field, covering roughly five-and-a-third miles of shoreline. Congress approved the project, but it stalled over the federal/non-federal funding formula. Based on the original Congressional authorization the district concluded that costs for periodic nourishment, which would include all beach fill beyond the initial construction, should receive only a minimal federal funding offset. New York State and Suffolk County were left to pick up the rest. Suffolk County Executive Peter F. Colahan felt the county's share was more than it could afford, and the New York State Department of Environmental Conservation announced that instead of agreeing to the cost sharing formula for the authorized project, it would instead pursue a Congressional reauthorization that might provide a more favorable division of the cost burden. (The Water Resources Development Act of 1974 had modified the Rivers and Harbors Act of 1960 to provide that non-federal interests would contribute 30 percent of the first costs of the Fire Island to Montauk Point Project, including the value of lands and easements, and New York State was looking for something more along these lines with respect to beach nourishment projects.) Beach replenishment planning for the Moriches to Shinnecock reach ground to a halt. Furthermore, since the most critical area of the entire Fire Island to Montauk Point project now lacked local support, work on the overall project reformulation, a plan of study for which had been approved in July 1980, was suspended as well. In frustration, the Westhampton Beach residents reactivated their suit against Suffolk County, asking for $200 million in damages, but this suit – which might have helped encourage Suffolk County to agree to the outline of a project in the late 1970s – had little effect in the early 1980s.

Indeed, nothing happened until the Water Resources Development Act of 1986 (WRDA86) applied the 70-percent federal cost-sharing provision of its 1974 forerunner to periodic nourishment at Westhampton Beach for twenty years. This brought New York State and Suffolk County back into the picture, and work resumed on both the Westhampton Beach interim project and the larger reformulation of the entire Fire Island to Montauk Point project. Between 1978, when the project foundered and the passage of WRDA86 in late October, nineteen homes west of the jetties were destroyed. Of the non-federal costs, 70 percent was New York State's share. This left Suffolk County with an acceptable 9 percent of the total project cost, but a political problem still remained to be solved. A split had developed among New York State agencies. The Department of Environmental Conservation supported the district's plan, while the Department of State and the recently formed coastal zone management agency, backed by the Governor's office, wanted a smaller project. After a series of meetings with the involved agencies, the district asked New York State to propose an acceptable plan.

In July 1989 New York State presented the district a variation on the recommendations contained in the 1980 supplement to the general design memorandum. The state's preferred interim plan included modification of existing groins and provided a lesser level of protection than the district proposal it modified. The district insisted on a few small technical changes so the plan would comply with Corps of Engineers coastal engineering practice, to which the state agreed, and in July 1990 the district renewed engineering and design work. In July 1991 the Environmental Protection Agency endorsed the Westhampton Beach interim plan subject to the preparation of an environmental assessment and reinstatement of the overall project reformulation study.

In late October 1991 Westhampton was hit by the "great Halloween storm," the worst northeaster since 1962. Twenty-five houses washed away. In 1992 the district began work on both the Westhampton interim project and the general reformulation study. Any enthusiasm this news might have generated among Westhampton property owners was muted in December by another northeaster that caused two significant breaches in the vicinity of Pikes Beach, just west of the fifteenth groin. The larger of these was closed by the district under the project authorization and cost-shared with New York State. The task took one month and involved the placement of approximately 50,000 cubic yards of sand dredged from the Intracoastal Waterway during routine maintenance that was under way nearby. Under the influence of later winter storms, plus tidal and littoral forces, the smaller breach, which was at first dubbed Little Pikes Inlet, grew to be more than half a mile wide and twelve feet deep before it was closed in November 1993 with material from an offshore borrow area. A number of houses that initially seemed safe washed away as the breach widened. At the time this breach was closed, approximately 170 homes had been lost west of the groin field.

Before the Westhampton breach was closed the district had an initial project management plan approved for its reformulation of the Fire Island to Montauk Point project. The study treated the entire project area as a system including the back bays and estuaries, as well as the mainland, and considered a wide range of possible plan alternatives for beach erosion control and hurricane protection. In response to the storm of December 1992 and another storm, nearly as destructive, that hit in March 1993, the district was directed by Congress to include in its reformulation effort a look at five areas for possible interim (i.e., stop-gap) projects that would be designed, according to New York State law, to provide thirty years of erosion control. The major interim project was at Westhampton.

Storm-threatened homes along Westhampton Beach, Long Island, New York, in 1991

At the end of October 1994 a major impediment to progress in Westhampton was removed when the suit from property owners was resolved after lengthy negotiation. The terms of the settlement included implementing the district's interim plan for Westhampton, while allowing property owners to build within certain standards, adding provisions for public access points to the restored beach, and incorporating endangered species protection. The Westhampton interim plan included: tapering the two westernmost groins to allow more sand to enter the east-to-west moving littoral system; building a new groin between the two tapered groins; filling the stretch between the eleventh and fifteenth groins with offshore sand; periodic beach re-nourishment; and monitoring. The court absolved the district of any blame or responsibility for the property damage at Westhampton.

It took until the middle of 1996 to secure the funding for the Westhampton Interim Project, convey the needed easements, and finish other requisite legal documents, during which time signs of a revived real estate market became evident as property owners began fixing buildings they had been neglecting. However, when construction of the Westhampton Interim Project was completed in December of 1997, not everyone applauded. Environmentalists were concerned that the project would encourage overdevelopment, and some engineers worried about the long-term effectiveness of tapering groins. Another complaint was raised by the coastal geologist, Orrin H. Pilkey, Jr. of Duke University, who is known for his radical retreat-from-the-shore views. In March 1996 Pilkey told the *New York Times* that replenishing the vulnerable area was a "futile effort." He was willing to

Scouring on the down-drift side of a groin along Westhampton Beach, Long Island, New York, circa 1996 “stake whatever reputation I have” on the prediction that “it’s not going to work.” As of 2006 this prediction has not proven accurate. The project has performed even better than expected. The groins and beachfill provide a good measure of storm protection. The plan called for beach replenishment every three years, as needed. Additional sand was not needed in 1999. In March 2001 when the first re-nourishment was completed it used less sand than projected, as did the second, which began in October 2004.

There are other measures of success as well. The population of piping plovers, a small shorebird that inhabits open sandy beaches, has increased in the Westhampton project area. Twenty-six nesting pairs of the threatened bird were counted in Westhampton in 1998, where there had been none in 1992. The population continued to grow after that but has recently leveled off at less than twenty. Under careful monitoring the nests are hatching enough fledglings to sustain the population, and with continued beach replenishment piping plovers can be expected to remain in the area. Considering another yardstick of success, the locals are proud of the degree to which public access to the Westhampton beaches has increased. Non-residents of the area can now use the county parks at Cupsoque and Southampton Town Beach, both of which were inaccessible in 1992.

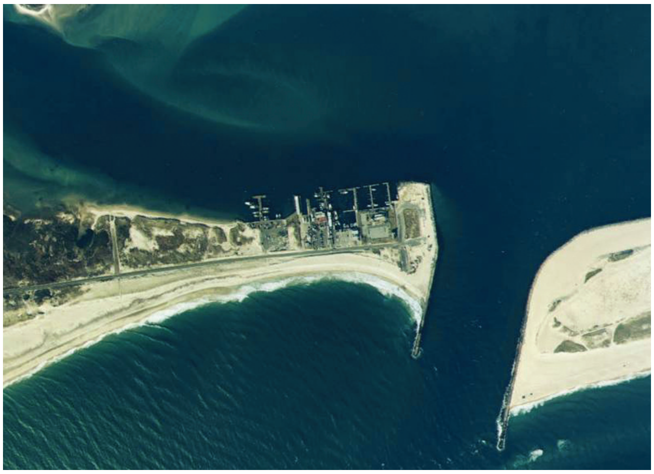
A section of replenished beach at Westhampton, Long Island, New York, circa 2000

Besides the Westhampton Interim Project, the New York District was directed to develop other interim projects along the barrier island between Fire Island Inlet and Moriches Inlet, and along a one-mile section of shoreline west of Shinnecock Inlet. In addition, the district initiated preparation of a breach contingency plan for rapid response when a barrier island is severed.

Moriches Inlet has a ten-foot deep federal navigation channel, authorized in 1985, that undergoes periodic dredging. Shinnecock Inlet, too, is dredged by the district. The costs of both projects are shared with New York State. Moriches Inlet never became an interim beach erosion project because some of the sedimentation problem at this location is being dealt with by pumping sand from its maintenance dredging, and some will be covered by the Fire Island interim project. A draft report on a Fire Island interim project that is similar to the plan built in Westhampton was released in December 1999. Fill would be placed in segments of Robert Moses and Smith Point parks and in the developed areas of Fire Island Park that are susceptible to breaching and overwash. The

Department of the Interior and New York State have raised environmental and coastal zone management concerns about this interim solution, and the district has deferred work on it until the reformulation study can address their issues. The 4,000 feet of shoreline immediately west of Shinnecock Inlet is subject to severe erosion and has required frequent emergency action. The West of Shinnecock Inlet Interim project put beach fill in the area using sand from offshore in a manner that is expected to encourage sand to bypass the inlet, mimicking natural sand transport, and reduce shoaling in the inlet and erosion on the down-drift beaches. Construction, which began in December 2004, was finished in March 2005.

Based on the district's experience with the breach at Little Pikes Inlet in 1992, which took thirteen months to close, it established a breach contingency plan with a procedure for the rapid closure of breaches. It calls for a coordinated response from involved agencies to initiate closure efforts within seventy-two hours of a barrier island breach. The breach contingency plan was approved in 1996, but has thankfully not yet been tested.



The strengthened and stabilized Shinnecock inlet, Long Island, New York, circa 2005

The 1996 Westhampton Interim Project was smaller than the earlier authorized project for this stretch of shoreline, and it was designed to be adaptable, as was the West of Shinnecock Interim Project, to the recommendations of the overall Fire Island to Montauk Point Reformulation Study. In June, after the Westhampton Beach settlement, the district issued an updated project study plan that detailed the level of effort that would be necessary for the overall reformulation study, and in 2000 it adopted a project management plan.

The Corps of Engineers, other federal agencies, state and local authorities, and local residents all felt that the scope of the Fire Island to Montauk Point Reformulation Study was so large that it should be preceded by a document outlining everyone's goals and intentions. This document, referred to as the "Vision Statement," to which the district, the U.S. Department of the Interior, the National Marine Fisheries Service, the New York State Department of Environmental Conservation and the New York State Department of State contributed, contemplated a plan for "restoration and enhancement of the natural processes of the barrier beach and bay ecosystems as part of the development of long-term solutions for storm damage reduction." This represents a break from previous practice, but in fact this philosophy emerged gradually over several decades.

In the 1970s storm and erosion damage protection were the only valid goals of Corps of Engineers projects. It had no missions that would support other aims. Gradually environmental improvements became a secondary objective of some Corps projects, as long as they remained consistent with the goal of maximum economic efficiency. In the next stage of this evolving policy some environmental considerations were calculated as benefits, but the maximum benefit model still prevailed. In the final vision statement, however, written after Congress authorized environmental quality as an official Corps of Engineers mission in 1990, the goal became to "restore the natural processes to the greatest extent possible to reduce the risk to human life and property." This suggests that the most benefit for the least cost solution is not the only alternative. Ecosystem restoration as an end in itself has become a full-fledged Corps of Engineers mission, and projects may aim to achieve this goal even at the expense of economic efficiency. The reformulation study vision expresses a desire to "balance the need to preserve and enhance natural systems with the needs of the millions of people who live, work and play along the south shore."

FIRE ISLAND INLET AND WEST

The first break encountered along the barrier island as one moves west along the south shore of Long Island from the Fire Island to Montauk Point reach is Fire Island Inlet. This inlet, which is heavily used by commercial and recreational fishermen, receives so much sand from the natural littoral drift that, despite the large jetty erected at the east side of the inlet's mouth in 1941, it still requires almost constant dredging. A "Fire Island Inlet and shore westerly to Jones Inlet" combined beach erosion protection and navigation control project was authorized in 1958. The inlet was dredged five times with large hydraulic dredges between 1959 and 1977, when the project became the "Fire Island Inlet to Jones Inlet Beach Erosion Control and Navigation Project," and it has been the subject of intermittent dredging with smaller hopper dredges as well. The project, which influenced the west end of the Fire Island to Montauk Point work, had two aims: to keep Fire Island Inlet navigable; and to nourish eroded beaches west of the inlet that were becoming depleted in part because of the jetty. The inlet was dredged in 1985 and again in 1987. In 1987 the sand from the dredging was beneficially used to build an undersea berm, or large sandbar, offshore of severely eroded Gilgo Beach in Babylon. The district's thinking was that the berm would slow erosion by absorbing wave energy, while sand from the berm would drift ashore and replenish the beach.

In 1988 the district enlarged or redesigned the Fire Island Inlet channel to accommodate increased traffic. It was a dual-purpose project, combining navigation improvement with shoreline protection. Gilgo Beach was used as a feeder. Sand from the project was placed on the beach in the hope it would nourish Gilgo Beach, thereby providing protection to Ocean Parkway, and join the littoral stream

The east end of Fire Island Inlet, Long Island, New York, in the 1980s

feeding beaches to the west. Since 1988 the inlet has been dredged biennially. The operation that was completed in 2004 dredged roughly 2.3 million cubic yards of sand, approximately 40 percent of which were placed on Gilgo Beach and 60 percent at Robert Moses State Park.

The next area to the west, the nine miles of shoreline between Jones Inlet and East Rockaway Inlet, consists entirely of Long Beach Island. Jones Inlet, at the east end of this reach, includes a busy federal navigation channel that provides access to Hempstead Bay. It is maintained by the district to a depth of twelve feet. Densely populated, Long Beach Island is generally flat with a slight, irregular slope toward the bay. Some areas have dunes, but the shoreline is mostly a continuous strip of low-lying beach, and during a storm there is little beyond some locally constructed groins to stop surging waves from overtopping the island. The district's involvement on Long Beach Island goes back to the mid-1950s when the island was studied as part of the combined beach erosion control and hurricane study. The resulting report, "*Beach Erosion Control and Interim Hurricane Study of the Atlantic Coast of Long Island, New York: Jones Inlet to East Rockaway*," issued in 1965, recommended a multipurpose shore and hurricane protection project for the oceanfront that included hurricane barriers, closure levees, an oceanfront dune, groin construction and reconstruction, and periodic beach nourishment. Widespread opposition to the plan centered on the proposed oceanfront dune, which locals characterized as "not compatible with" the development on the island. The district modified the plan in various ways, but could not come to an agreement with the local interests on what action should be taken. In July 1971, the district terminated the study.

There things stood, though observers knew that storms were reducing the dimensions of the barrier beach and increasing its vulnerability. Hurricane Gloria battered Long Island in late September 1985, the first serious hurricane to hit in more than a decade. It killed one person and inflicted an estimated $100 million worth of damage on Long Island. In Gloria's aftermath Congress authorized a reconnaissance study, released in 1989, that found a federal interest in protecting Long Beach Island from storm damage. Work on a cost-shared feasibility study began in May 1991.

Shoreline development on the barrier beach of Long Beach Island, Long Island, New York, in the 1980s

During this study the district began thinking about the potential for using material from the maintenance dredging of the Jones Inlet navigation channel for storm damage protection. A report recommending that dredged material be placed at Point Lookout on the eastern end of the island was approved in August 1993. It was based on Section 933 of WRDA86, which created a 50/50, federal/non-federal split of the additional expense that placing sand beneficially on adjacent beaches represents over offshore disposal. Dredged material from Jones Inlet was placed at Point Lookout in 1994, a year before the "*Long Beach Island, New York: Final Feasibility Report with Final Environmental Impact Statement for Storm Damage Reduction*" was approved, though the Village of Atlantic Beach dropped out of the project because they were unwilling to provide the requisite level of public access. WRDA96 authorized the project for construction, and not long after a small unincorporated village in the Town of Hempstead called East Atlantic Beach joined the Village of Atlantic Beach in opting out of the project, again because of a disinclination to provide public access to their beach. This did not require any major alterations in the overall project plan, so preliminary engineering and design proceeded.

Public access to beaches was not the only obstacle, however. The plan called for a groin field at the east end of Long Beach Island where the rate of erosion was most severe, but this scared many locals who feared a replay of the Westhampton Beach situation. In March 2000 the district completed a "*Technical Reanalysis of the Shoreline Stabilization Measures for the Eastern Portion of the Long Beach Island, New York Project*," but it was only partially successful in addressing public concerns. Local interests continued to question aspects of the project, the initial costs of which were approaching $100 million, and the New York State Department of Environmental Conservation was reluctant to sign a project cooperation agreement before it could be certain the involved municipalities would fulfill their financial commitments.

Federal regulations require a revised economic analysis of any project when more than three years have passed since the last one. Such an analysis became part of a limited reevaluation report on the project, which the district produced in February 2006 as "a decision document for budgeting and construction." A hearing held in the city of Long Beach in the following month suggested that local consensus was still not achieved on how to protect Long Beach from the encroaching sea, and a unanimous city council vote in June rejecting the district's $98-million plan that would have cost the city of Long Beach $7 million, confirmed this.

The district has not had difficulty working with local interests in the East Rockaway Inlet to Rockaway Inlet segment where, historically, there has been a problem with shoreline erosion along Rockaway Beach. Authorized in 1961, the *Atlantic Coast of New York City from East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, New York: Cooperative Beach Erosion Control and Hurricane Study (Interim Survey Report)* came out in 1964. It resulted in a Congressionally authorized project for beach erosion control and hurricane protection that covered 6.2 miles of heavily developed Rockaway Beach. Modified by the Water Resources Development Act of 1974, the project included initial construction and periodic nourishment for a decade. Work began in 1975, and was completed in September 1977. The replenished beach did not withstand a sequence of severe storms that came later that year and in 1978. Emergency repairs were made later in 1978 and in 1979, and periodic nourishments were carried out in alternate years from 1980 to 1988.

Depleted shoreline at Rockaway Beach, Queens, New York, circa 1978

Soon after the beach nourishment work of 1988 another batch of strong storms hit the Rockaways, and the shoreline eroded badly once again. The Water Resources Development Act of 1986 extended the allowable period for re-nourishment, and a district re-evaluation report approved in May 1994 took advantage of this, recommending three triennial replenishments. A Project Cooperation Agreement for a $55.9-million beach re-nourishment project was signed a year later, and the most recent of these replenishments was completed in February 2004. Aware that nature could take back this sand as it had the millions of cubic yards deposited earlier, the district entered into an agreement with the New York State Department of Environmental Conservation for a reformulation study to look for means of providing long-term shoreline protection to Rockaway Beach. This effort fell victim to the vagaries of the federal budget process. It received no funds in federal fiscal year 2004, but was funded in 2005, which allowed some work to proceed. It was not included in the 2006 federal budget.

Coney Island is the westernmost of Long Island's barrier beaches. Now a roughly six-mile-long peninsula, it was formerly an island separated from the mainland by Coney Island Creek (actually a strait) until the 1940s, when parts of the creek bed were filled in to accommodate the Belt Parkway. Controlling erosion and protecting the Coney Island peninsula from hurricane damage poses engineering challenges similar to other locations along the south shore of Long Island.

Although in geomorphic terms Coney Island is a part of Long Island, this southern beach section of Brooklyn is administratively part of New York City. The beach at Coney Island received the first replenishment effort in the United States in the early 1920s, and it was once the site of the largest amusement area in the United States. Coney Island began to decline after World War II; the opening of Disneyland in southern California in 1955 is a symbol of its eclipse. In the late 1960s, when the district got involved at Coney Island, the area was approaching its low point. The amusement business was nearly gone, and the neighborhood was increasingly impoverished.

The New York District began to study the area in 1969. In 1972 it unveiled a $27.5-million plan, which relied heavily on armoring, at a public presentation in the Coney Island Aquarium. The district recommended three surge control structures at inlets, levees and a dike at various locations, bulkheads at others, a jetty and two groins, and deposition of large quantities of hydraulic sand fill to extend the beach. The most controversial element of the plan was a fifteen-foot-tall concrete and steel seawall slated to run from Manhattan Beach to Sea Gate. Local opposition to the seawall and some of the other proposed structural elements was reflected in the report released in 1973, "*Atlantic Coast of New York City from Rockaway Inlet to Norton Point, New York (Coney Island Area), Cooperative Beach Erosion Control and Interim Hurricane Study (Survey)*." This report argued that the dual-purpose project it had presented orally in Coney Island was economically justified, but because local interests did not

A crowded Coney Island, Brooklyn, New York, circa 1925

Eroded beach at Coney Island, Brooklyn, New York, circa 1975

support it, the document included a beach erosion control recommendation that consisted of restoring the public beach to the full extent of the historical shoreline, building or extending terminal jetties to hold the sand fill in place, and periodic nourishment.

Local interests were sympathetic to this revised plan, but they wanted a bigger beach. They asked the district to expand the beach 250 feet beyond its historical maximum extent. The district did not say this was impossible, but pointed out that the federal funding formula then in place required local interests to pay for all the work that took a beach beyond its historical shoreline. The locals were unwilling to consider taking on the increased financial burden. They chose instead to work through Congress for increased federal funding for the larger beach.

The civic leadership of Coney Island got what it requested in the Water Resources Development Act of 1986, which authorized a project to extend the beach at Coney Island 250 feet beyond the historical shoreline with the non-federal share of additional costs at 50 percent. With strong local support, there was cause for optimism that this project would go forward, but first it had to overcome a serious obstacle. Of the various alternatives, the district had demonstrated the beach extension project provided the largest net economic benefit, basing its calculations largely on the enhanced recreational use of the beach. After 1986, however, the administration of President Ronald Reagan reduced recreation to secondary importance, arguing that that its benefits were experienced too locally for it to provide a major justification for federal investment in a project.

This meant the Coney Island beach protection project would require a reanalysis of the economic benefits it would provide. There was a lot at stake. The project had received considerable media attention, and Senator Daniel P. Moynihan was very interested in it. The district felt it was an opportunity to show that the Corps of Engineers did not build only for the affluent and well connected. No one wanted to announce a decision not to proceed. But one of the reasons Corps of Engineers projects are built in prosperous areas is precisely because of the required economic analysis; it is much easier to show economic benefits from improvements in areas where residents have capital at risk. This turned out to be the key. As the district team began restudying the area, their attention turned to the considerable amount of money that was invested in property such as apartment buildings, subsidized housing projects, other buildings, and even the boardwalk. Much to the relief of all involved parties it turned out that the project offered a substantial net economic benefit purely in terms of the value of damage it would prevent to this property.

With this economic reanalysis complete, engineering and design moved ahead. In April 1991 the district circulated a draft general design memorandum for a Coney Island area shore protection project that included restoring and augmenting the public beach, expanding an existing terminal groin on the west, building a new one on the east, adding 2.3 million cubic yards of sand to the beach, and re-nourishing it decennially for a half century. Before the draft reached final stage, the Intermodal Surface Transportation Efficiency Act of 1991 added optional relocation of comfort and lifeguard stations at full federal expense to the project authorization, but this work was deferred. The lifeguard stations were redesigned in 1996, but funds for construction were not available.

When the work on the shoreline protection project began in late 1994, the Coney Island beach was in worse condition than it had been when the final general design memorandum was issued in April 1992 owing to a vicious northeaster that struck that year, and several other storms. Nevertheless, the district was able to replenish the beach, and the project was well received upon completion. New York City's manager of Parks and Recreation for Brooklyn predicted the project would stabilize the beach for many years, and the borough agreed, investing millions in the next few years on benches, water fountains, and other amenities. In 2001 a minor league baseball team, the Brooklyn Cyclones, began playing in a new ballpark at

Coney Island. The Corps of Engineers project, the first significant public investment in improvements at Coney Island, stimulated a reinvigoration of Coney Island that was still under way in 2006 involving the rehabilitation of neighborhoods, the influx of new immigrant groups, and the revival of the amusement industry. The district is proud of its role in revitalizing this historic community.

The improvements at Coney Island did not come about without controversy that erupted into a bitter dispute between residents of Sea Gate, a gated community at the western tip of the peninsula, and their neighbors. Sand was unexpectedly building up around the western end of Norton's Point, creating a bayfront beach in Sea Gate where none had existed before, and depleting an area just west of the western groin of the project at West 37th Street. The Coney Island Beach replenishment project had even included a "fillet of sand" beyond the groin to prevent this, but it was not enough. To address the problem, the district did two things. In June 1996 it instituted an interim project that protected the groin and nourished the beach with 35,000 cubic yards of sand, and it began studying longer-term means to reduce erosion in the Sea Gate reach and accretion along the Gravesend Bay shoreline. In March 1998, meanwhile, the district issued a technical report, "*Sea Gate Reach of Coney Island: Field Data Gathering Project Performance Analysis and Design Alternative Solutions to Improve Sandfill Retention,"* which reached two conclusions. Nourishment of the Sea Gate reach would be required more frequently than once a decade as had been estimated in the early 1990s. It also recommended constructing a series of T-shaped groins to improve sand retention down-drift of the West 37th Street groin (the T-groins were subsequently authorized in the Water Resources Development Act of 2000). The district removed sand from Gravesend Bay as another interim step in May 2004, and a limited reevaluation of the Sea Gate reach improvements was completed in September 2004. Although plans and specifications were nearing completion in the spring of 2006, there was no construction money for the project in the federal fiscal year 2006 budget.

Replenished beach at Coney Island, Brooklyn, New York, circa 1996

NORTH SHORE OF LONG ISLAND

The New York District has been far less involved on Long Island's north shore than its south. The north shore's irregular shoreline, with landforms that range from high bluffs to inlets, bays, and harbors, makes up the southern margin of Long Island Sound. It does not face open ocean and is, therefore, not subject to relentless wave attack. Nor are the infrequent hurricanes that cross Long Island as damaging on the north shore as they are on the south. The principal cause of flooding and beach erosion on the north shore is northeasters that push water from the sound into vulnerable coastal communities.

Asharoken Beach in the Town of Huntington, roughly forty miles east of New York City is a narrow sandbar, or tombolo, approximately 2.5 miles long. It supports Asharoken Avenue and provides the only connector between Eaton's Neck and the rest of Long Island. Storm-induced erosion and overwashing have forced numerous road closures over the years. In the early 1990s an 800-foot-long section of the tombolo was in imminent danger of breach. In 1995 the district undertook an emergency continuing-authorities project and designed an innovative seawall and a fabricated dune that, when finished in December 1997 was expected to provide at least fifteen years of protection to Asharoken Beach.

In the meantime, Asharoken was not the only north shore community having difficulties with flooding and beach erosion. A reconnaissance study for the entire north shore was authorized by the House Committee on Public Works and Transportation in May 1993. Released in September 1995, it recommended projects for the Village of Bayville in Nassau County and the Village of Asharoken in Suffolk County. It also recommended separate pre-feasibility examinations in a number of other locations because the extent of storm-related damages incurred in these areas made it likely that sufficient benefits could be derived from shore protection efforts. These areas included Lloyd Neck, Makamah Beach, Port Jefferson, Rocky Point, Kennys Beach, and Truman Beach. In the mid-1990s shore protection projects were a low priority of the Clinton Administration, but a feasibility study for Bayville was granted an exception. The study got under way, but stalled when it received no funds in the 2006 budget.

Asharoken Beach on the north shore of Long Island, New York, circa 1995

Although technically located between the north and south shores of Long Island, the Montauk Point Hurricane and Storm Damage Reduction Project is considered part of the north shore's shoreline program. This project will provide protection to the Montauk Point Lighthouse and related complex, a property listed in the National Register of Historic Places. The project's recommended plan calls for the in-kind replacement of the existing, failing, stone revetment wall. A feasibility study and environmental impact statement were completed for this project in 2005.

MONMOUTH COUNTY, NEW JERSEY

People have been trying to hold back the Atlantic Ocean with seawalls and other structures longer on the New Jersey coast than anywhere else in the United States. Many of the groins, jetties, revetments, and so forth were built when scientific understanding of coastal processes was rudimentary, and many did more harm than good. The five-mile-long Sea Bright-Monmouth Beach seawall, for example, prevents northern movement of sand that replenishes Sandy Hook, causing an intermittent threat to its link with the mainland. Between 1977 and 1982, a particularly vulnerable area, known as South Beach, washed out five times, and the National Park Service, which operates Sandy Hook as part of its Gateway National Recreation Area, briefly considered options for managing the park as an island, but eventually decided against it. At the Park Service's request, in 1982 the New York District placed 2.4 million cubic yards of material dredged from adjacent navigation channels at the critical zone at the southern end of Sandy Hook.

The Sea Bright seawall, Monmouth County, New Jersey, at low tide, circa 1980

The Sea Bright seawall, Monmouth County, New Jersey, overtopped by Atlantic high tides, circa 1980

Convention Hall in Asbury Park, which was several hundred yards from the shoreline when it was built in the 1920s, had waves lapping against its pilings during high tides in 1980. The general rate of shoreline erosion (ranging, according to Corps of Engineers estimates, from no net loss in some locations to an average loss of nearly four feet a year at Sea Bright and Monmouth) can explain much of this, but the groins that Ocean Grove built in the years after World War II contributed as well. Large groins in Allenhurst likewise starve beaches in Deal. Among some coastal experts the groins and numerous other coastal structures of New Jersey are so notorious that the process of building them is called "New Jerseyization."

A limited reconnaissance study of the New Jersey coast conducted by the Philadelphia District (with which the New York District cooperated) observed in 1990 that "the history of the Corps involvement in the New Jersey coast is long and involved." The following paragraphs present a mere summary of this complicated tale. The New York District's boundaries only include approximately 40 percent, basically the Monmouth County portion, of the New Jersey coast, and the account that follows confines itself to this reach.

There is no discernible pattern to who built the groins, jetties, seawalls, and other armor that mark the New

The Atlantic Ocean lapping at the piers beneath the Asbury Park Convention Hall, Monmouth County, New Jersey, in the 1960s

Jersey shoreline. The state started studying coastal erosion issues in the 1920s. Between 1922 and 1930 it inventoried existing structures and issued criteria for building others. The fifty-one-mile reach in the New York District's jurisdiction, from Sandy Hook to Manasquan, had 188 structures before the recent beach replenishment work buried some of them. They were built by private interests, and by municipal, state, and federal government.

In 1945 the Corps of Engineers studied the New Jersey coast "with a view to providing protection against damage resulting from floods due to tide and wind." The report, submitted to Congress in November 1949, did not find federal interest in a project, which would have been limited in any event to publicly owned beaches. It suggested instead that state and local entities look at the problem of beach erosion in critical locations. In April 1948 the Corps conducted an experiment off Long Branch to see if sand dumped into relatively deep water would move shoreward naturally. A hopper dredge carrying 602,000 cubic yards of sand that it had dredged from the New York-New Jersey harbor dropped its load into thirty-eight feet of water roughly a half mile offshore, thereby creating a ridge on the ocean floor seven feet high, almost three-quarters of a mile long, and 750 feet wide, in an effort to create an "offshore subaqueous stockpile." After eighteen months of monitoring the federal Beach Erosion Board concluded the experiment had been unsuccessful.

In the early 1950s the state of New Jersey and the Corps of Engineers cooperatively investigated the 127-mile-long coastline from the northern tip of Sandy Hook to Cape May. This massive study led to a number of smaller follow-up investigations. The New York District conducted a "*Shore of New Jersey from Sandy Hook to Barnegat Inlet, Beach Erosion Control Study*," which was released in July 1955. This report recommended federal participation in a project to restore and protect the area between Sea Bright and Ocean Township (now Loch Arbour) by creating a beach up to one hundred feet wide with fourteen million cubic yards of sand, building twenty-three new groins, extending fourteen existing groins, and establishing feeder beaches for periodic nourishment. The total cost was estimated at \$3.1 million federal and \$21.7 million (plus an estimated \$830,000 annual maintenance cost) non-federal. The non-federal share was so large because the law did not allow federal support for privately owned beaches. New Jersey Governor Robert B. Meyner requested a more "satisfactory financial arrangement," but federal participation was limited by law to one third of the first cost of protecting publicly owned beaches. Because New Jersey did not commit to paying its share of the project cost, the study went to Congress in March 1956 without the support of Secretary of the Army, Wilber M. Brucker.

In July 1956 Congress allowed periodic beach nourishment to be considered construction if it was the most suitable remedial measure, and it allowed federal assistance to privately owned beaches if they were publicly used, or if nearby public beaches would benefit from the work. As a result of these changes a review of the 1956 report resulted in an increase to \$6.8 million in the federal participation in the Sandy Hook to Barnegat Inlet project. Congress approved this project in the Rivers and Harbors Act of 1958. But neither this nor the Rivers and Harbors Act of 1962, which further increased the federal share of shore protection projects, was enough to bring in New Jersey as the non-federal sponsor. *[illustration 7.18]*

The year 1962 saw two developments along the Monmouth County coast. Erosion problems along the 1.5-mile-long seawall in Sea Bright and Monmouth Beach became so serious that in April the district built an emergency beach, placing more than 1.4 million cubic yards of sand in front of the monolithic breakwater. Also, through a combination of authorities, the Philadelphia District began a study of New Jersey coastal inlets and beaches with respect to navigation, beach erosion, and storm protection. The reach within the New York District's boundaries from Sandy Hook to Island Beach State Park, including the Shark River and Manasquan inlets, was last on the list. Work on a study of this stretch began in February 1968 with an initial public meeting in Asbury Park where a number of illustrations were presented showing the need for beach nourishment in the area. By 1974 the Philadelphia District had reached the preliminary conclusion that no changes were necessary in the existing authorization for a beach erosion control project, with the possible exception of the inlets. The study suggested that when the project was finally launched, the feasibility of sand bypassing at Manasquan and Shark River inlets should be investigated during pre-construction planning.

As the Philadelphia District study went on, pressure for action continued to mount. A severe storm season in 1977 did a lot of damage, contributing to the heightened sense of urgency expressed at a late-stage public meeting held by the Philadelphia District in Neptune in 1978. In contrast to ten years earlier, attendees spoke of a number of shorefront properties in immediate danger, but elected officials reiterated that little or no local funding was available for the requisite cost sharing.

View looking north across the Atlantic Highlands toward Sandy Hook in the 1990s

In 1983 storms blasted the New Jersey coast from Cape May to Sandy Hook. The National Park Service spent $10 million on sand replenishment in the first quarter of the year alone, on top of the 1982 emergency work the district had carried out. Needed repairs to the Sea Bright-Monmouth Beach seawall were estimated at $7.5 million or more. As awareness grew that local funds were being spent on shore protection in Monmouth County whether or not the money matched federal dollars, the state of New Jersey showed signs of trying to go in two directions at once. On the one hand, the state considered various legislative means to limit new construction along the coast and even to prevent damaged structures from being rebuilt. On the other hand, the coalition of real estate interests, mortgage lenders, and local officials that blocked these efforts helped win the fight for a $40-million Shore Protection Bond in 1983. The money was dedicated toward the state's share of various projects to restore sand and repair bulkheads, jetties, and groins.

The real breakthrough came when the Water Resources Development Act of 1986 (WRDA86) created terms for a Sea Bright to Manasquan Inlet project that New Jersey could agree with. It authorized "a berm of approximately fifty feet at Sea Bright and Monmouth Beach extending to and including a feeder beach in the vicinity of Long Branch," and set the non-federal share of the construction and maintenance costs of the project at the $12-million cost of rebuilding the seawall in Sea Bright and Monmouth Beach, on condition that public access be provided to it. Representative James Howard, who grew up in Belmar, was instrumental in the construction of the berm. His district included coastal Monmouth County, and he chaired the House Public Works Committee, where much of the bill was crafted. His close awareness of the shore erosion issue in his district, understanding of the Corps of Engineers, and strategic mastery of Congressional procedures, for which he was renowned, combined to produce a result closely calibrated to what was locally required to move the project along.

Based on the WRDA86 authorization the district proceeded with preliminary engineering and design, during which the work was broken into two sections. The first section consisted of the most northerly twelve miles of the authorized project, from the southern limit of Sandy Hook in Sea Bright to the outlet of Deal Lake. The northern piece of this section was a barrier spit where the beaches made up a sandy peninsula between the ocean and the bay into which the Shrewsbury and Navesink rivers empty. The rest was a headland where the beaches were attached to the mainland. The second section consisted of the nine-mile reach extending south from Asbury Park to Manasquan. Both sections were heavily developed. The northern section was made up of small and large houses, condominiums, town houses, and businesses. The southern section consisted mostly of single-family homes, many of which were occupied year round. It had fewer multiple-dwelling units, and many fewer businesses than the stretch of shoreline to the north.

The New York District considered twelve possible ways to protect the beaches in the northern section from erosion, inundation, and wave attack. They ranged from no action or a buyout to various combinations of seawalls, breakwaters, and other hard structures. In its first implementation anywhere, the district employed a Corps of Engineers-developed computer model for assessing shoreline process called "Genesis." Reflecting the gradual move away from armoring toward beach nourishment without structures as a preferred coastal management practice, the district ultimately concluded that a one-hundred-foot-wide beach berm provided the greatest net benefit.

In 1988 Representative Howard died unexpectedly, but his influence on the beach protection effort in Monmouth County continued. Shortly after his death the Water Resources Development Act of 1988 (WRDA88) modified the project authorized in 1986 in two ways. WRDA88 authorized a one-hundred-foot-wide project "substantially in accordance" with the plan recommended in the draft general design memorandum the district circulated in May 1988 with an initial cost of $91 million and an additional $1.2 million annually for periodic beach nourishment. Since the cost of the project had escalated, and the proposed construction now consisted of a beach twice the size of the beach contemplated in 1986, the funding formula changed as well. The $12 million New Jersey spent repairing the seawall would only cover its share of the first $40 million of the construction costs. Everything in excess of that figure required the non-federal cost share specified in

BEACH NOURISHMENT

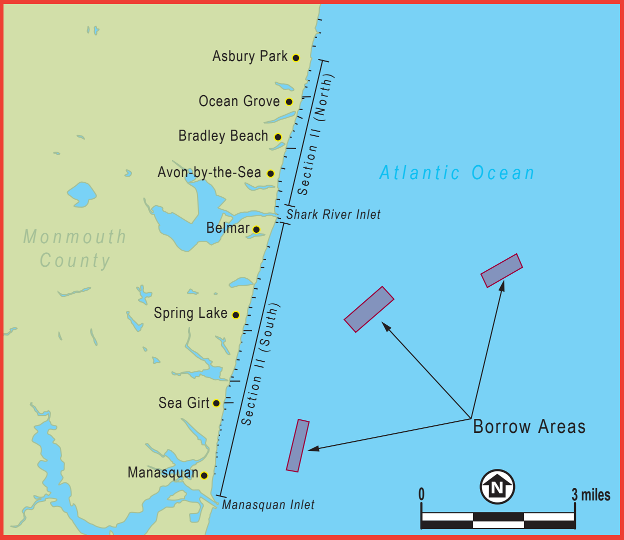
Beach nourishment involves the introduction of supplementary sand along a shoreline. During the second half of the twentieth century nourishment became the preferred means of reducing potential storm damage along the coast. In the 1960s more than 60 percent of the money spent on beach restoration projects nationwide went into hard structures; in the 1990s this figure was below 20 percent.

There are several reasons for nourishing a beach, chief among them: to control erosion by providing a sacrificial source of sand; to offset scouring and other effects of groins and similar hard structures; or to replenish reserves of sand normally supplied by dunes. In a typical beach nourishment project, sand is placed along the shoreline either by dredging it from offshore borrow sites and pumping it onto the beach, or by hauling it overland by truck and dumping it. Either way, the sand added to a beach provides a buffer. As large waves strike the replenished beach, sand is carried offshore and deposited in a bar. As the bar grows, it causes incoming waves to break farther offshore.

BEACH NOURISHMENT (CONTINUED)

The useful life of a nourished beach depends on how quickly it erodes, and it can be completely eliminated in a short period of time by a severe storm. Stewards of nourished beaches must expect to periodically add more sand to them. The rate at which new fill must be added depends on the coarseness of the fill material relative to the original beach sand. The more closely the new fill matches the native beach materials the better. In general, when fill material is coarser than native material it erodes more slowly; when finer, it erodes more quickly.

Along the Monmouth County coast of New Jersey, the district typically dredges sand hydraulically with hopper dredges and pipes it onshore. From the discharge point, standard earth-moving equipment is used to distribute the sand, thereby minimizing the need to move the pipe. This method also involves what is sometimes called "over-building" because the total volume of fill required to rebuild the beach berm, some of which is underwater, is placed above water on the beach. Eventually it migrates toward the part of the berm that is underwater. This results initially in a beach that is considerably larger than the target design width. In the case of the Sea Bright project the beach immediately at the end of the work was between and two and four times as wide as its one-hundred-foot targeted width.



WRDA86 – a minimum of 25 percent. WRDA88, like its predecessor, stipulated that the non-federal interests had to agree to provide public access to the beaches rebuilt by this project, a recurring sore point for some. Following severe storms in 1991 and 1992, and facing the potential to start several storm-damage protection projects, the New Jersey legislature dedicated an annual $15 million from real estate transfer taxes toward shore protection efforts.

The northern section of the project was broken into four segments – Monmouth Beach, Sea Bright, Long Branch, and Deal. A $19.6-million contract to place 4.6 million cubic yards of sand along the three miles of shore in Monmouth Beach was awarded in January 1994 to Weeks Marine, Inc. Dignitaries threw ceremonial spadefuls of sand in March, work began in earnest in May and was finished in November 1995. A contract for 3.8 million cubic yards at Sea Bright was awarded in July 1995, and finished a year later, in November 1996.

As work got under way on a project first authorized by Congress nearly forty years earlier, murmurings of discontent that had followed the project for years grew audible. Critics focused on three issues, similar to those raised on Long Island: the beneficiaries; public access; and longevity. The first argument contended that the real beneficiaries of this massive investment of public funds were not the public but the relatively few property owners in the vicinity of the replenished beach. As D.W. Bennett, Director of the American Littoral Society and an advocate of leaving the shore to its own natural devices, put it: "What we're talking about here is real estate protection, not shore protection." There was some inherent truth to this criticism. Because Corps of Engineers projects must show a positive benefits to costs ratio, its shore projects must, as a district Chief of Planning told the *New York Times* in 1994, "protect more capital than we spend on repairing beaches."

The second issue the critics raised was public access to the beach. Some of the towns whose beaches were replenished in New Jersey complied only minimally with the public access requirement of the statutes. "Access at the New Jersey shore means parking," observed Bennett, but Monmouth Beach, for example, planned to build only eighty parking spaces. Sea Bright more generously planned eventually to add 400 spaces. However Sea Bright was not planning to put more lifeguards on the beach to accommodate any extra visitors. The two towns combined contained within their boundaries nearly six miles of new beaches, only one quarter of which were to be patrolled and would offer amenities such as public toilets and drinking fountains. Monmouth Beach actually tightened some of its restrictions. Summer beach passes were available only to residents. Outsiders, even those from nearby inland municipalities, had to buy more expensive daily passes. Whatever the merits of the public access complaint, there is little the district can do about it because it only designs and builds the projects that Congress funds. The federal legislation governing the Sea Bright project specifically required that it conform to state-established access criteria.

The third issue critics raised concerned how long the sand would remain in place. Dr. Stuart Farrell, a geomorphologist and coastal engineer from the Richard Stockton College of New Jersey, was blunt. He told the *New York Times*: "The Army Corps of Engineers can build a beach; there's no question about that. How long it stays there is another story. Some skeptics say six months, tops. My feeling is they will have to go back after three years and replace half of it." The district, supported by the New Jersey Department of Environmental Protection, estimated that the previous few years had been exceptionally stormy and that the sand would last better than the pessimists were predicting, and they have been right. The sand has held up better than expected, although in mid-1995 there was a scary moment when a 500-foot-long strip in Monmouth Beach was washed away by storm waves, and the critics pounced, calling the restoration wasteful. The district acknowledged that there was a "hot spot" in Monmouth Beach, but could not truly assess the situation until the project was finished. Subsequent analysis suggested this area sticks out into the sea a little further than was first realized, which explained why it was the only area in the reach that eroded so quickly.

In December 1998 the third piece of the northern section was finished to Lake Takanasee in south Long Branch. The fourth section from Long Branch to Deal is on indefinite hold because the state of New Jersey has been unable to secure the necessary property easements. In the long term this could be cause for concern because the district's analysis suggested that the success of the design was contingent on all pieces being constructed.

While sand, which was dredged from nearby offshore borrow areas, was being pumped ashore in the northern section, planning for the southern section, the reach that extended from Asbury Park to Manasquan, went ahead. The district arrived at a plan for this section quite similar to that for the northern section, though it estimated much less sand would be required because the beaches were in better shape to start with. The general design memorandum for the southern section was released in April 1994, a few months after the first contract had been awarded in the northern section. Some of the state match toward the cost of the southern section was contributed in a manner similar to the northern section. The Water Resources Development Act of 1992 authorized crediting the costs incurred stabilizing the seawall at Belmar and Spring Lake against the non-federal share of the project costs.

The nine-mile reach between Asbury Park and Manasquan was broken into two contracts. The first, for the southern portion, from Shark River Inlet south to Manasquan Inlet, was awarded in June 1997 and completed in October 1997. Groins in Spring Lake, which is in the approximate center of this reach, were notched to increase the amount of sand that would move through the littoral system, and thereby provide better feed to the hot spot that was developing. Work on the northern portion from Asbury Park to the Shark River Inlet was completed in June 2000. During the entire project the contractors took great care to identify and avoid significant shipwrecks and other submerged cultural resources.

The plan called for re-nourishment on a six-year cycle, but the first re-nourishment contract for Sea Bright and Monmouth Beach was not necessary until August 2001, eight years after the initial construction. The project has performed far better than anticipated. This could turn out to be important because the first re-nourishment contract in the Asbury Park to Manasquan section is not currently funded, and its prospects are uncertain. The plans and specifications for the first renourishment of the south reach of Section II (Belmar to Manasquan) and the south reach of Section I (Long Branch) were completed to the 90-percent design level in 2005. A $3-million appropriation for them was included in the fiscal 2006 budget. Combined, the Sea Bright to Manasquan Inlet project covered twenty-one miles of shoreline; it is the most extensive beach

A scalloped beach between groins at the Shark River Inlet, circa 1990 nourishment project ever undertaken by the Corps of Engineers and, at 25.4 million cubic yards of sand, one of the largest beach fill projects in the world by volume.

Reflecting the increasing ecological sensitivity of Corps of Engineers shoreline projects, the New York District carefully monitored Sandy Hook to Barnegat region's aquatic habitat before, during, and after shoreline protection work to assess the impact of construction. The monitoring work was designed to evaluate the potential impact of subsequent re-nourishments in Monmouth County and of similar projects in the New York-New Jersey area. It corroborated conclusions from studies elsewhere that negative environmental impacts from beach nourishment are minor. In a similar vein, during planning of the Asbury Park to Manasquan Inlet Beach Erosion Control Project, the district conducted an extensive monitoring program assessing potential impacts of sand dredging and placement operations on biological resources. The district established its Biological Monitoring Program in response to specific concerns raised by state and federal environmental agencies. The program's findings were intended both to assess impacts associated with the immediate dredging and filling operations, and to be useful in evaluating the potential environmental impact of similar projects elsewhere.

The Sea Bright to Manasquan Inlet project received recognition in April 2006 when the American Shore and Beach Preservation Association named the project, the largest restored beach in the United States, to its annual list of the nation's top restored beaches. The restored beach was recognized for its successful effort to restore the health, ecology, and protective benefit of the Monmouth County coastline.

Monitoring the effects of beach nourishment on the offshore fish population on the New Jersey shore, circa 2003

The district worked west of Sandy Hook as well as south of it. A multi-location project for combined beach erosion and hurricane protection was authorized along the south side of Raritan Bay in the Flood Control Act of 1962. The project, whose full title was, "*Raritan Bay and Sandy Hook Bay, New Jersey: Beach Erosion and Hurricane Control Project*," called for work in five locations in four municipalities: at one location each in Old Bridge (formerly Madison) Township, Aberdeen (formerly Matawan) Township, and Union Beach Borough, and at two locations in Keansburg Borough. Work in two of the municipalities – Old Bridge and Keansburg – was authorized for shore and hurricane protection; work in Union Beach and Aberdeen addressed only shore protection. The difference between the dual- and single-purpose authorizations lay in the dimensions of the authorized beach fill and levees.

Construction of levees in Old Bridge Township began in 1965 and finished in October 1966. Beach fill and groins were begun in Keansburg and East Keansburg in 1968, after some delay arranging for local cooperation. This work was finished in June 1974. The projects in Aberdeen and Union Beach never got started due to a lack of local cooperation. In 1972, however, the state of New Jersey approved a local project to build a stone seawall in Aberdeen to protect a rapidly eroding cliff, a bulkhead and groin nearby, and a variety of non-structural steps, including beach fill. The hard construction was finished in 1976 and by late 1982 167,000 cubic yards of sand had been added. By 1984 most of it was gone. Following Hurricane Gloria in September 1985, local, state, and federal reports all concurred that nearly 50,000 cubic yards of sand, and considerable construction would be necessary to return the area to its early 1980s condition.

The southern shore of Raritan Bay in the Keansburg/Belford Harbor area of Monmouth County, New Jersey, circa 1990

In 1990 Congress took two actions pertaining to Raritan Bay and Sandy Hook Bay. In January it de-authorized the un-built parts of the 1962 Raritan Bay and Sandy Hook Bay project; and in August the House Committee on Public Works and Transportation called on the Corps of Engineers to look into modifying its 1962 recommendations for erosion control and storm damage prevention in Raritan and Sandy Hook bays. The Water Resources Development Act of 1992 altered the original construction authorization for Cliffwood Beach in Aberdeen to provide for fifty years of periodic beach nourishment. But since the project had been de-authorized, a second look at the economics of federal involvement was necessary before Congress could extend authorization to build at Cliffwood Beach.

A reconnaissance study, based on the House Committee resolution of 1990, provided this second look. In addition to Cliffwood Beach, five other potential projects came out of this study issued in 1993. These were located in Highlands, Keyport, Leonardo, Union Beach, and Port Monmouth. In two of them, Highlands and Keyport, which had not been part of the 1962 flood control authorization, plan formulation was under way in 2006. Highlands, an area less than three-quarters of a square mile in extent, is at the eastern terminus of the Raritan Bay and Sandy Hook Bay. Approximately 880 residential and commercial structures and many low-lying roadways are subject to severe flooding. During severe storms portions of Highlands can be cut off from one another. In Keyport the primary problem is coastal flooding. The community currently has no protective beach seaward of its bulkheads, and most of the bulkheads near the west side of the study area are extremely low and frequently overtopped. The bayside also floods. When various roadways, including Route 36, are flooded during severe storm events, the Borough of Keyport can become isolated.

The reconnaissance report recommended cost-shared feasibility studies in Leonardo and Union Beach to determine the viability of federal participation in flood and storm damage reduction. In Leonardo the problem is that low-lying structures experience coastal storm inundation. A study cost-shared with the New Jersey Department of Environmental Protection began in July 1999. The district presented several shorefront protection alternatives to a public meeting in July 2002. A preliminary alternatives report, released in June 2003, argued that a non-structural solution – elevating some homes – was the only economically justifiable approach. This conclusion was presented to a public meeting in September 2003. Completion of the plan is expected in 2006.

Union Beach, a small community at a low elevation coursed by numerous small creeks, is frequently inundated during heavy coastal storms and vulnerable to wave attack. The town's situation has worsened in recent years as the beaches have eroded, the population has grown, and the tidal creeks have become more constricted. Cost-sharing with the New Jersey Department of Environmental Protection was arranged in 1997. A final feasibility report and environmental impact statement recommending implementation of a $113-million plan were released in January 2004. The recommended project combines levees, floodwalls, tide gates, and pump stations with a dune and beach berm and terminal groins. The plan, which received approval from the Corps of Engineers headquarters in January 2006, also includes wetland mitigation sites to compensate for losses that the project will cause. Work on a design agreement was under way in June 2006.

The largest project to come out of the 1993 reconnaissance study is at Port Monmouth in Middletown Township. This project will provide protection to low-lying structures built on and near salt and freshwater marshes that have been experiencing progressively worsening floods due to multiple causes: rainfall, erosion, wave attack, and constriction of tidal creeks. In June 2000 the district released a feasibility report that had been called for in the reconnaissance study of 1993. It recommended federal participation in a combined hurricane and storm damage reduction project that would involve building more than 7,000 feet of levees, 3,500 feet of floodwalls, 2,600 feet of dune, and decennial beach re-nourishing. The project was authorized for construction for hurricane and storm damage reduction in the Water Resources Development Act of 2000. The pre-construction, engineering and design phase began in May 2002, but due to reduced federal funding it was scaled back to focus only on the coastal features of the project. Plans and specifications are complete and a project cooperation agreement with the New Jersey Department of Environmental Protection can be signed when Congress puts construction funds in the federal budget.

On some levels the replenishment of beaches is one of the most inherently controversial of the Corps of Engineers' major functions. Some oppose it on environmental grounds, others see it as a Sisyphean effort doomed to failure. Still others think that while desirable it is impossibly expensive; they argue it is far beyond the means of the federal government to keep a fixed amount of sand along the nation's coastal edge. But Americans love their beaches. More people move closer to the shore every year. Nearly the entire length of the coastline within the New York District's civil works boundaries is under federal management. The projects have held up very well, better in most cases than the district's own projections. But the time will come when more work is needed. The Corps of Engineers will be ready to apply advanced coastal engineering knowledge to the problem, but the issue of how much the federal government will contribute to the effort and where the other share will come from is likely to be quite contentious.

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Official New York District documents, such as reconnaissance, feasibility, limited reevaluation, engineering-design-documentation, after-action, and other reports, project management plans, and general design memoranda, provided much of the project-specific data for this chapter. Many of these public documents were loaned by district staff members involved with successor or related projects. Additionally there are four small libraries within the Jacob K. Javits Federal Building where many district reports could be found at the time of writing: in the Engineering Division, the Planning Division, the Environmental Analysis Branch, and the Programs and Projects Management Division. Back issues of the *District Times*, the New York District's internal newsletter, which are kept by the Public Affairs Office, were helpful as well.

Most of the controversies discussed in this chapter took place in the New York metropolitan area and were covered in the *New York Times.* These articles, cited below, were found through the use of *ProQuest Historical Newspapers* and *Lexis/Nexis Academic.*

Information for this chapter also came from formal interviews conducted with current or former district senior managers. William Slezak contextualized the entire effort at coastal storm damage reduction. Eugene Brickman discussed the significance of the Monmouth County, New Jersey project. Stuart Piken, Samuel Tosi and Eugene Brickman recalled aspects of the Fire Island to Montauk Point overall effort. Frank Santomauro's comments on Shinnecock Inlet, Westhampton Beach, and Coney Island were informative. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Informal conversations with other current and former New York District employees were also informative, particularly Thomas Pfeiffer on coastal Long Island and Lynn Bocamazo on New Jersey.

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Frank Santomauro, Chief, Planning Division, New York District. Interviewed November 16, 2005, by Howard Green.

William Slezak, Chief, New York and New Jersey Harbor Programs Branch, New York District. Interviewed December 14, 2005, by John Lonnquest.

Samuel Tosi, Chief, Planning Division, New York District (retired), and Louis Pinata, Chief, Construction Division, New York District (retired). Interviewed December 2, 2005, by Howard Green, Chris Ricciardi, and Carissa Scarpa.

8 Environmental Remediation and Restoration

A commitment to environmental goals has developed gradually in the Corps of Engineers to the point where ecosystem restoration is now a fully recognized component of the civil works mission. All New York District civil works projects treat environmental issues as a high priority. Much of the work involves the cleaning up of past practices that were once acceptable, but which we now find have led to unanticipated impacts to habitats, natural resources, or to the physical environment. A similar situation has unfolded on the military side. Programs that remediate existing and formerly used defense sites and sites associated with the development of atomic power and weaponry provide important environmentally based projects for the district. As with civil works endeavors, all district military projects strive to be environmentally responsible.

Remediation in progress, Maywood, Bergen County, New Jersey

The first steps toward formalizing the Corps's environmental program came when the agency's regulatory program entered the realms of clean navigable waterways and ocean dumping in 1972 and wetlands conservation in 1977. Chapter 4 discusses how the New York District learned to broker an atmosphere where stakeholders with conflicting interests expected to be satisfied by regulatory decisions. In the formulation of project plans, although the Corps could incorporate recreation, fish and wildlife enhancements, and some aspects of pollution abatement, it could not include environmental considerations in its cost-benefit analyses. In these early years, as the public became more supportive of the idea that the federal government should be an agent of environmental improvement, the district began to define some environmental objectives as good engineering. But just as the Corps of Engineers was regaining its balance, the incoming Reagan administration in 1980 set a new direction. Assistant Secretary of the Army for Civil Works, William Gianelli spoke, in 1981, of getting the Corps of Engineers back "to what it's good at" – planning, designing, and building major water projects. He wanted to simplify and accelerate the planning process so that more big water projects could be set in motion.

Nevertheless the pull toward greater environmental responsibility continued to gather strength. In the late 1970s the district supported the Environmental Protection Agency (EPA) in the administration of a competitive grant program for local sewerage authorities and other entities to build wastewater treatment plants. The EPA hired the Corps of Engineers to supervise this program and to ensure that the proposals were technically sound and the facilities were being built to the specifications that the EPA had approved. These plants, on which construction began in the late 1970s, significantly reduced the amount of sewage and wastewater that made their way into the Hudson-Raritan ecosystem and thus made an important contribution to the improvement in water quality that has been observed in the estuary.

In December 1980 Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which taxed the petrochemical industry to establish a $1.6-billion (later raised to $8.5 billion) "super" fund for cleaning up abandoned or uncontrolled hazardous waste sites. CERCLA authorized short-term removal actions for contaminated surface soils or leaking drums containing hazardous substances, and longer-term remedial actions to permanently and significantly reduce the risks associated with releases of toxic and hazardous wastes at sites included by the EPA on a National Priorities List. Based on provisions in the law, the EPA reached an agreement with the Corps of Engineers in 1982 (revised in 1984), that it could ask the Corps to manage contracts and provide technical assistance in support of Superfund hazardous waste site cleanups.

In 1983 Congress created the Defense Environmental Restoration Program, which aimed at correcting environmental damage that had resulted from past military practices. This initiative included the Formerly Used Defense Sites (FUDS) program under which the

New York District undertook extensive remediation at the Raritan Arsenal.

The Corps' explicit environmental mission grew in steps. The Water Resources Development Act of 1986 led the way, authorizing the Corps of Engineers to carry out demonstration modifications of older projects "for the purpose of improving the quality of the environment in the public interest." The Water Resources Development Act of 1990 further established "environmental protection as one of the primary missions of the Corps of Engineers." Nationally, by the end of 1995, the Corps had twenty demonstration projects under way or completed, and at least forty-three feasibility studies in progress or completed. The 1990 act also established a "no net loss of wetlands" policy as an interim goal of Corps of Engineers water resources projects.

While the environment emerged as an important factor in many New York District projects (as, for example, in the effort to find beneficial uses of dredged material), the Nepara Park/Tie-In flood damage reduction project in Yonkers, on which work began in 1994, represented the district's first serious consideration of environment issues as a high priority in plan formulation (this project is discussed further in Chapter 5). The district's explicit environmental work in 2006 consisted of: habitat restoration or creation; brownfield remediation; hazardous waste cleanup, including Superfund sites; and water quality improvement.

The Formerly Used Sites Remediation Action Program (FUSRAP) was administered by the Department of Energy until 1997 when the Energy and Water Appropriations Act of 1998 transferred it to the Corps of Engineers. It is the most recent addition to the agency's environmental portfolio. The program cleans up low-level radiation sites associated with the early years of the nation's atomic energy program.

The various programs introduced here – Superfund, FUDS, FUSRAP, along with environmental restoration projects – are discussed in greater detail in the remainder of this chapter. All essentially involve an attempt to right the wrongs of the past and they suggest the shape of the Corps' transition into an environmentally conscious agency. As environmental concerns have entered the national psyche, many past practices are now considered objectionable and require corrective actions. Such actions are now central to the Corps' environmental mission, especially as it relates to water resources.

SUPERFUND

New York was the first Corps of Engineers district to manage the cleanup of Superfund sites. The district's first important Superfund project started in 1985 as a pilot project to remediate contaminated soils created around the turn of the twentieth century in Essex County, New Jersey, where the U.S. Radium Corporation had manufactured glow-in-the-dark watch dials using radioactive paint. U.S. Radium disposed of its radium-laced waste by mixing it with coal ash and burying some of it in nearby dump sites; the rest was used locally as landfill. Eventually, homes were built on the dump sites and on filled areas in Montclair, West Orange, Bloomfield, Glen Ridge, and East Orange and these became contaminated with radon, a byproduct of the decomposition of radium. Radon is both a radiological poison and a carcinogen.

The pilot cleanup project began with four houses in Glen Ridge and four in Montclair, but the New Jersey Department of Environmental Protection and Energy (as it was then known), could not find a disposal site for the contaminated soil, and the work soon ground to a halt. In 1990, after the government found a hazardous material disposal site in Utah, cleanup resumed on the most severely contaminated sites, including five houses in Montclair that had been sitting vacant since 1985.

The project ultimately addressed some 250 acres in five municipalities. It involved nearly 800 residences and twenty-four municipal properties. The cleanup was broken into fifteen construction phases that addressed the sites in descending order of contamination. The remedy in all cases was the excavation and off-site disposal of all contaminated soil, and the restoration of the properties. The degree of remediation varied from property to property. In some cases, excavation of only a small area was required. On sites with the highest level of contamination total excavation of fill from the entire perimeter of the house, and beneath the basement slab was necessary. In locations requiring the removal of contaminated soils from under the basement slab, or excavations that blocked access to a house, or disruption of utilities, occupants were relocated while the cleanup was in progress. The 170,000-plus cubic yards of contaminated, excavated soil was contained in polypropylene bags and transported by rail to Utah.

Workers wearing personal protective equipment excavate contaminated soil at the U.S. Radium Superfund site in West Orange, New Jersey, circa 1985

The district passed an important test when environmental cleanup workers first returned to the long vacant homes in Montclair. As area residents saw the neglected properties finally cleaned up, and the contaminated soil bagged and shipped off, they began to appreciate that the area would in fact be made habitable again. By making complete openness a hallmark of the project – all project documents were available and all meetings were open to the public – the district earned the high regard of the community. When a construction trailer needed to be set in a local playground, the District built a replacement park, further improving relations with the community. Most of the homeowners eventually agreed to participate in the program, and roughly one third had to relocate for three months into temporary residences that the district rented for them. Soil excavation was completed in December 2004.

Workers wearing personal protective equipment dislodge contaminated soils from the sheetpile during remedial cleanup of a residential area in Montclair, New Jersey, circa 2000

Removal of contaminated soil taking place adjacent to home at the Federal Creosote Superfund site in Manville, New Jersey, circa 2000

At the time it was undertaken, the Montclair Superfund job was considered out of the ordinary because it involved residential properties, but over the years other jobs have involved residences as well. In 1997 high levels of creosote (polycyclic aromatic hydrocarbon), a probable human carcinogen, which was used to make wood less susceptible to insect damage, were found in the soil at a fifty-acre residential and commercial development in Manville, New Jersey. The site once contained the American Federal Creosote Wood Treatment Facility, which closed in the late 1950s. Further testing revealed that canals and two lagoons dug by the developer were the source of contamination, which was in sediment, soil, and groundwater, posing health risks to the area.

In early 2000, to remediate the Federal Creosote site, the EPA turned to the Corps of Engineers, and the New York District assembled a virtual project delivery team that involved five districts from two divisions. (A virtual team seldom meets physically; its members communicate by phone, e-mail, video conference, or other means.) The New York District led the remedial action phase of the project with the help of the Philadelphia District. The Omaha District managed contracts, the Baltimore District handled real estate services, and the Kansas City District was in charge of remedial design and technical assistance. The $100-million project began in the fall of 2000. It involved the demolition of seventeen homes, asbestos abatement, capping and relocating utilities, backfilling and covering basements, removing vegetation and groundwater, constructing a retaining system because a lagoon abutted the CSX Railroad tracks, building a wastewater treatment plant, excavating contaminated canals, and transporting contaminated material to three disposal facilities. Soil remediation at the site was slated for completion in 2007, with groundwater remediation to continue beyond this date.

FORMERLY USED DEFENSE SITES

The long-abandoned Raritan Arsenal is the scene of one of the New York District's largest Formerly Used Defense Sites (FUDS) projects. The northern half of this 3,200-acre facility has been redeveloped and is now used by roughly 20,000 people a day. It includes: Raritan Center, which was the largest industrial park in New Jersey in the mid-1990s; Thomas Edison Park, a county recreational park; Middlesex County College; and EPA Region II facilities. The southern half of the site is wetlands. From 1917 to 1961 Raritan Arsenal was used to store, modify, and destroy weapons and ordnance, assemble equipment, and conduct training. In its prime, from World War I to World War II, it was a major shipment and storage point for projectiles, fuses, grenades, mortars, and other munitions. Most operations ceased at the arsenal in the 1950s; it was declared surplus property in 1962.

The Corps' initial investigation at Raritan Arsenal in the late 1980s was supported by the Kansas City District, because at the time this district led all FUDS projects east of the Mississippi. The study concluded that the area contained a variety of unexploded ordnance and that it might contain buried chemical warfare agents such as mustard gas or other hazardous and toxic waste.

The district began follow-up investigations at Raritan Arsenal in May 1991. Since New York is not a center of expertise in hazardous, toxic and radioactive waste removal, a number of other districts (New England, Kansas City, Omaha, and Baltimore) provided technical support. The Huntsville Design Center – the center of expertise in military munitions – supported the removal of ordnance from the site, which proved difficult for two reasons. First of all much more ordnance was found than was predicted, including projectiles, grenades, booster

World War I-era fifty-pound bomb casings unearthed in the early 1990s at Raritan Arsenal in Edison, New Jersey

adaptors, and thousands of fuses. Secondly, while exploding the live ordnance on site was the safest thing to do, the detonations rattled the neighborhood generating complaints that drew the attention of local officials. By placing sandbags over the ordnance pits the noise was sufficiently muffled for detonations to resume. By 1995 nearly 300,000 ordnance items had been removed from the site. In 2006 the district was still removing ordnance from discrete areas of the former arsenal.

Investigations of hazardous and toxic waste carried on while the ordnance removal was under way identified heavy metal and organic pollutants in the soil in some areas within the boundaries of the arsenal. By 2006 the district had removed contaminated soil from all but one of these locations. In addition a variety of other studies were performed at Raritan Arsenal: surface water and sediment investigations, groundwater studies, and baseline ecological risk and human health assessments. Eight groundwater plumes potentially contaminating the air in buildings above them have been identified. The district studied indoor air quality at sixty buildings and installed five remedial systems.

ENVIRONMENTAL RESTORATION

The New York District's largest environmental initiative is the Hudson-Raritan Estuary (HRE) program. After its authorization in April 1999, a reconnaissance study found a significant federal interest in environmental restoration in this broadly drawn area around the mouth of the Hudson and Raritan rivers. Following a further report, the district entered a cost-sharing agreement with the Port Authority of New York and New Jersey in May 2001 for a Hudson–Raritan Estuary Ecosystem Restoration Feasibility Study, which is now under way. The study area includes the Hudson River as far upstream as Croton Bay, the Upper and Lower (to the Rockaway-Sandy Hook transect) New York and Newark bays, the East River, the western end of Long Island Sound, the tidal Passaic, Hackensack, and Raritan rivers, the Kill van Kull, and the Arthur Kill.


Hudson-Raritan Estuary Ecosystem Restoration Study
HRE Study Area Boundary
NEW YORK
CONNECTICUT
NEW JERSEY
New York
New Jersey
Connecticut
New York
Saw Mill River
Yonkers
Paterson
Hackensack
River
Passaic River
Hackensack
Hudson River
Bronx
Manhattan
New York City
East River
Newark
Jersey City
Queens
Long Island
Elizabeth
Bayonne
Brooklyn
Jamaica Bay
Staten Island
Lower New York Bay
Woodbridge
Perth Amboy
Raritan River
New Brunswick
Raritan Bay
New York
New Jersey
Sandy Hook
Atlantic Ocean
Long Branch
N
0
10 miles

Salt marsh islands in an estuarine habitat in Jamaica Bay, Brooklyn and Queens, New York, circa 2000

The HRE feasibility study's goals are to identify factors that degrade the estuary and to formulate realistic means of restoring its ecosystems. The study has two primary components: a Comprehensive Restoration Implementation Plan (CRIP) and various interim ecosystem restorations at specific locations in the estuary. The CRIP, which will include a potential project implementation sequence, is nearing preliminary formulation. It will also contain a master plan for restoring the system that will include actions taken outside the traditional authority of the Corps, making it a true watershed-based plan. A feasibility report would follow that identifies the actions the Corps can undertake and recommends a construction sequence for their implementation. The region was broken into eight study areas: Jamaica Bay; Lower New York Bay; Lower Raritan River; the Arthur Kill and the Kill van Kull; Newark Bay and the Hackensack and Passaic rivers; the Lower Hudson River; Harlem River, East River, and western Long Island Sound; and the Upper New York Bay.

Opportunities for habitat improvements identified in the plan will include removal of undesirable fill and vegetation, and restoration of tidal flows and re-contouring of selected harbor bottom areas to restore the habitats of benthic organisms, fish, and wildlife. Finding beneficial ways to use material dredged from the New York-New Jersey harbor during the channel deepening projects is another element of the restoration plan. Such material can be used to help restore habitats: for example, by restoring eroded wetland islands in Jamaica Bay or by replacing contaminated sediment with clean sediment.

The Hudson-Raritan Estuary study's interim habitat restorations or enhancement projects, which will make use of methods like those the CRIP is identifying, include: HRE-Liberty State Park; Gowanus Bay and Canal; the Hackensack Meadowlands; and HRE-Lower Passaic. Liberty State Park, the site of the first HRE interim project, was built on a former railyard that had been created by decades of adding fill to the estuarine wetland. The study area comprises 234 acres of undeveloped park wetland in varying stages of environmental degradation. The investigation is considering restoration alternatives such as reintroduction of tidal wetland habitat, protection and enhancement of freshwater wetlands, and management

View of Liberty State Park, Jersey City, New Jersey, with Ellis Island in the background, circa 2000

of allied terrestrial buffer habitats. With the New Jersey Department of Environmental Protection as the non-federal sponsor for the project, construction could begin at Liberty State Park in 2007, contingent upon authorization and funding. Advanced design and preparation of plans and specifications are already under way utilizing state funds under a Support for Others agreement.

Ecological restoration of the Gowanus Canal is a particular challenge. The area was once the site of heavy industry and there are a lot of hazardous materials in the canal bed. In addition, the natural habitat has been drastically altered. The feasibility study, on which the non-federal partner was the New York City Department of Environmental Protection, got under way in February 2002. It is considering removing or capping channel sediments, various other means of reducing further contamination, and other water quality improvements, such as hydrological and hydraulic alterations, and wetlands creation.

In the Hackensack Meadowlands a $5.2-million feasibility study for environmental restoration began in April 2003 with the New Jersey Meadowlands Commission as the non-federal sponsor. The approximately 8,450 acres of wetlands that remain in the Hackensack Meadowlands are the largest remaining brackish tidal wetland complex in the Hudson-Raritan Estuary, but much of it has been degraded by filling, alteration of the natural hydrology, leachate contamination, point source pollution from industrial or sewage treatment plants, and diffuse runoff from rain and snowmelt that picks up natural and human-made pollutants such as fertilizers, herbicides, salts, and bacteria known as non-point source pollution. The study will produce a plan for the Meadowlands that will be fully coordinated with the Comprehensive Restoration Implementation Plan. The habitat restoration effort will focus on large, undeveloped but degraded areas. Habitat restoration possibilities include: removal of fill; restoration of tidal flow to enhance habitat value and water quality; removal of impairments to fish migration on tributaries;

and capping of contaminated sediment areas. The project has two additional goals. One aims at restoring naturally diverse marsh vegetation to the vast tracts where it has been choked out by the invasive species *phragmites.* The other intends to make beneficial use of dredged material from the New York and New Jersey Harbor Deepening Project for habitat enhancement and restoration.

The New York District also has a flood control study in progress in the Meadowlands. Here is an example of a handful of dual-purpose (ecosystem restoration and flood damage reduction) projects that the district has under way. The Corps of Engineers was authorized to assist the Meadowlands Commission in efforts to "protect, preserve, and monitor wetlands in the Meadowlands ecosystem." Working with the Corps' Engineering Research and Design Center, Waterways Experiment Station, located in Vicksburg, Mississippi, the district developed a hydraulic model of the Hackensack River and its tributaries in 2004. In 2006 the district was awaiting updated data from the Meadowlands Commission before beginning to assess alternative solutions to the problem of flooding in the Berry's Creek Basin.

The Union Street drawbridge over the Gowanus Canal, Brooklyn, New York, circa 2000

Marsh grasses in New Jersey's Hackensack Meadowlands, circa 2000

The Lower Passaic River, a seventeen-mile tidal stretch from the Dundee Dam to the river's confluence with Newark Bay, has a long history of industrial development. Abandoned or under-utilized factories line the riverbanks, the natural hydrology of the reach has been altered by a number of flood control structures, and the environment is seriously degraded. Water quality is poor, the sediment is contaminated, wetlands are significantly reduced, and a variety of biotic habitats are debased. Because the Environmental Protection Agency has added the entire seventeen-mile reach to its Diamond Shamrock Superfund Site, the area the district is authorized to study for possible ecosystem restoration is also the subject of a remedial investigation and feasibility study according to the terms of the Superfund Reauthorization Act of 1986. These overlapping studies have been joined into one integrated undertaking that will address water quality improvement, remediation, and restoration opportunities.

This joint effort to coordinate remediation and restoration along the Lower Passaic River is also a pilot project of the Urban River Restoration Initiative. The aim of this initiative is to develop a comprehensive plan for the Lower Passaic basin in which remedial alternatives and ecosystem restoration measures will be analyzed together. The study will include: a cost-benefit analysis of remediation and restoration opportunities, as required of Corps of Engineers projects; an analysis of the risk posed by the existing conditions of contamination, as required by the Superfund program; and consideration of a "no-action" alternative. Remediation possibilities include sediment removal, capping, or decontamination, and controls on combined sewer outfalls. Restoration steps, which would follow on the heels of any remediation action, may include benthic and aquatic habitat improvement, tidal wetland restoration, and shoreline stabilization.

The industrialized banks of the Lower Passaic in Newark, New Jersey, in the late 1990s

For its $9-million portion of the project costs, the New York District entered into a 50/50 cost-sharing agreement with the non-federal sponsor, the New Jersey Department of Transportation, Office of Maritime Resources, in June 2003. In June 2004, the EPA signed an agreement with thirty-one companies it held “jointly and severally liable” to pay the remaining $10 million for the study. The thirty-one, all of whom had plants in the Lower Passaic basin, included major corporations like Amerada Hess, Benjamin Moore, DuPont, Lucent, Pfizer, Sherwin Williams, and Viacom. The study was in progress in 2006.

The Diamond Shamrock facility on the Passaic River, Newark, New Jersey, source of dioxin contamination in Newark Bay, in 2000

In addition to the Hudson-Raritan Estuary study, the Corps is also nearing completion on three feasibility studies to restore ecosystems in Flushing Bay, Jamaica Bay, and the Bronx River. A recent law enacted by New York City calls for a comprehensive improvement plan to manage and guide future restoration work in Jamaica Bay, and as a part of this plan the city has formed an advisory committee and invited the Corps to fill one of its seven seats.

Other smaller restoration efforts have been moving forward under the Continuing Authorities Program (CAP), whereby Congress authorizes and funds a particular program. The Corps then determines, based on Congressional guidelines, which projects can move forward. Under the CAP umbrella, the Corps has entered into agreements for a diverse group of projects. Some of the studies the Corps has begun to undertake under the CAP include: restoring eroded wetlands with the New York Department of Environmental Conservation and the New Jersey Department of Environmental Protection; filling degraded borrow pits in cooperation with the Port Authority of New York and New Jersey; and excavating fill and restoring salt marsh with the New York City Department of Parks and the New Jersey Department of Environmental Protection. In addition to the CAP projects, in 2006 the Corps was working on developing memoranda of understanding with non-government environmental organizations such as the Audubon Society and the Nature Conservancy. These memoranda will enable the Corps to work collaboratively with these organizations in the future.

FORMERLY USED SITES REMEDIATION ACTION PROGRAM

When Congress assigned the Corps of Engineers responsibility for the Formerly Used Sites Remediation Action Program (FUSRAP) in 1997, the Corps used civil works boundaries as a basis for allocating work under this program to the districts. The New York District received four projects: Maywood, Middlesex, and Wayne in New Jersey, and Colonie, New York. These projects comprised the majority of the North Atlantic Division's FUSRAP construction. The Middlesex site fit the program's original design, which was to clean up low-level radioactive waste generated by government atomic energy experiments in the 1940s, 1950s and 1960s. Although the other sites were not associated with the federal atomic energy program, Congress added them to FUSRAP because they contained the same contaminants – uranium, radium, and thorium – that FUSRAP was created to handle.

When the district began its four FUSRAP projects, district engineer Colonel Gary Thomas promised a seamless six-month transition with no loss of momentum on remediation efforts already under way. The district, which was the "door to the Corps" on these projects, brokered technical work to districts in Kansas City and Baltimore. The district wanted to move quickly because in Maywood, for example, residents had been waiting many years for government action. Part of the district's success with the program came because it emphasized good communication with all the involved parties. In the environmental program involving all stakeholders has become standard business practice and has contributed to the success of many projects.

The district's arrival at the Maywood site was initially greeted with skepticism by local residents. District representatives met with each affected family in their homes in an effort to instill confidence. The Maywood Chemical Works processed thorium and rare earths (naturally occurring oxides widely found in small amounts in certain minerals; they are used in glassmaking and ceramic glazes) and spread radioactive material to eighty-eight properties in the surrounding neighborhood, some via the Lodi Brook Channel, which crossed Maywood Chemical's lot. In the spring of 1998 one residence and a park had been remediated by the excavation and offsite removal of contaminated soil and twelve families were relocated so cleanup could begin. By the summer of 2006, when all of the residential properties had been remediated, the district had removed 175,000 cubic yards of contaminated soil. In 2006 cleanup work was underway at a motor vehicle office, vehicle inspection station, and driver testing center which required careful coordination to minimize disruption of service during subsurface characterization of soils and ground water.

Hazardous waste cleanup at the site of the Maywood Chemical Works in Maywood, New Jersey, circa 2000

The Middlesex Sampling Plant, where the mineral pitchblende was assayed from the mid-1940s until 1967, covers almost ten acres. Pitchblende was imported from South Africa during the early years of the atomic energy program because it contains ores of uranium, thorium, and beryllium. After the pitchblende was analyzed in Middlesex it was sent elsewhere for processing. When the plant closed in 1967 the site was decontaminated to then current standards. However, traces of radioactive materials that had reached nearby residential lots were overlooked and radioactive waste that had been disposed of at the Middlesex municipal landfill was ignored. In the 1980s the contaminated residential properties were cleaned up and the landfill was excavated. The contaminated soil from these operations was stored in specially constructed piles on the site. In 1997, a year before the New York District took over the operation, the processing building was demolished and its structural steel stockpiled for recycling. In 1998 the district disposed of the stockpiled steel and the contaminated soil from the landfill. In 1999 it removed the soil that came from the nearby properties and began monitoring air and water at the site to determine the effectiveness of the measures taken so far. By 2002 the monitoring was completed. The sampling of the soil and, in 2002, the groundwater, represented important steps toward the final cleanup of the site, which the district is addressing under the terms of the Comprehensive Environmental Response, Cleanup and Liability Act (CERCLA).

The Environmental Protection Agency added the Middlesex Sampling Plant to the National Priorities (Superfund) List in January 1999, and a Record of Decision for Soils (ROD) was signed in September 2005. A ROD is a public document that explains alternatives judged appropriate for cleaning up a Superfund site. Soil remediation in accordance with this ROD was scheduled for completion in 2007. The Corps of Engineers is currently coordinating a groundwater feasibility study and proposed remedial action plan with the EPA and the New Jersey Department of Environmental Protection.

The 6.5-acre Wayne Interim Storage Site (WISS) in Passaic County, New Jersey was contaminated by the processing of thorium and rare earths that took place here between 1948 and 1971. In 1974 W.R. Grace, the last owner of the site, partially decontaminated it, but left behind burial pits that contained processing wastes and building rubble in which thorium (the most serious contaminant at the site), radium, and uranium were present. WISS is a Superfund site that is also on the Environmental Protection Agency's National Priorities List, qualifying it for remedial action. Between 1985 and 1987 approximately 38,500 cubic yards of radioactive material gathered from nearby locations was piled on top of the 1974 waste pit. The district disposed of this interim storage pile in 1997, and between 1998 and 2001 it took care of all contaminated material on the property. The EPA certified the work was complete in September 2003, and follow-up groundwater monitoring was completed in the summer of 2006 with no recurrence of contamination identified.

Cleanup under way at the Wayne Interim Storage Site in Passaic County, New Jersey, circa 2000

The site in Colonie was a National Lead Industries (NL) facility from 1937 until 1984, when it was shut down by the New York State Supreme Court. In the course of manufacturing or electroplating various components that made use of uranium and thorium, National Lead spread radioactive exhaust around its eleven-acre site as well as onto fifty-six neighboring properties. The company also left a large quantity of contaminated (mostly by lead) casting sands on its site. When Congress gave the NL site to the Department of Energy as a decontamination research and development project, the Department put it in its Formerly Utilized Sites Remedial Action Program (FUSRAP).

In 1997, when the Corps of Engineers received its FUSRAP mandate, the New York District reevaluated the earlier Department of Energy remediation plan for the National Lead site. While that plan called for a limited removal of some contaminated soil, it mostly created a "designated area," on the property in which contaminated soil was to be buried in a landfill. The district concluded that the clay- and silt-heavy soil of the site was not suitable for a designated area. Under the district's plan, adopted in 2001, material contaminated with uranium-238 above a certain level was disposed of off-site and affected areas were capped by approximately two feet of clean soil. Soils heavily contaminated with lead and other metals were removed to a depth of nine feet. Soil remediation was slated for completion at the Colonie site in 2007, thus making it available for commercial and residential development.

Soil remediation in progress at the National Lead Industries site in Colonie near Albany, New York, circa 2005

Environmental remediation and restoration were added to the repertoire of Corps of Engineers capabilities in the last decades of the twentieth century. As the condition of the environment became a national concern, the need to right the wrongs of the past became evident. The Corps of Engineers was among the federal agencies called upon to undertake corrective actions.

By the early twenty-first century all district civil works and military projects were treating environmental issues as a high priority, but the district became an environmentally conscious agency in a series of uneven steps. In the early 1970s, while the Corps could not include environmental considerations in its cost-benefit analyses, the district began blending environmental objectives into its engineering. In 1982 the Corps began working on Superfund hazardous waste site cleanups, and the Formerly Used Defense Sites program of 1983 brought an extensive remediation project at the Raritan Arsenal to the district.

1990 was a milestone year as environmental protection became one of the "primary missions" of the Corps of Engineers, and no net loss of wetlands became a goal of all its water resources projects. By the mid-1990s beneficial environmental outcomes had become a priority in the formulation of all district plans. The Formerly Used Sites Remediation Action Program, which cleans up sites associated with the early years of the nation's atomic energy program, is the most recent addition to the Corps's environmental portfolio.

There is still an enormous need for cleanup of industrial and military sites and restoration of sensitive environmental habitats within the district's boundaries. To the degree that the public supports it and Congress appropriates funds, this type of work could grow to comprise an ever larger share of the district's mission.

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Interviews with Samuel Tosi, Leonard Houston, and Eugene Brickman provided valuable perspective on the development of an environmental program in the district, augmenting other sources. Aspects of the Superfund program were explained in interviews by Stuart Piken and Louis Pinata. William Slezak and Leonard Houston discussed the harbor estuary vision and the Hudson Raritan Estuary study. These interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. Informal conversations with other current and former New York District employees were also informative. Back issues of the *District Times* and *Engineer Update* provided information on many of the FUDS and FUSRAP projects, as do the district's own Project Fact Sheets.

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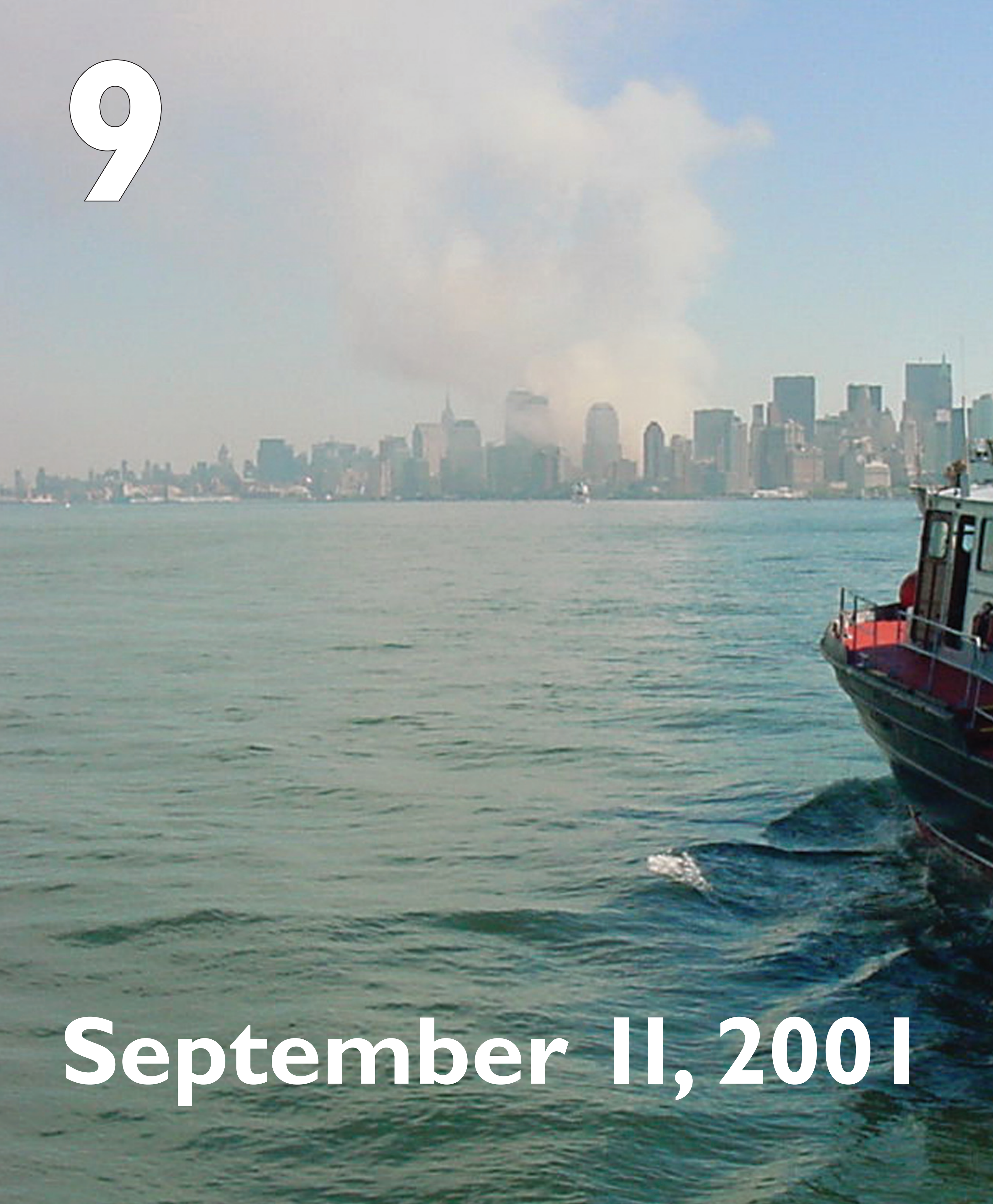
9

September 11, 2001



The terrorist attacks on the World Trade Center and the Pentagon not only killed nearly 3,000 innocent people, amounting to one of the bloodiest days in American history, they altered the path of world events. No matter how remote from New York or Washington an American was on September 11, 2001, the day is etched in his or her memory. For the New York District, 9/11 was particularly harrowing because the main office was less than half a mile from the twin towers. In the days and weeks that followed, the district assisted with emergency operations, reconstituted itself, awarded millions of dollars in year-end contracts, and played a key role organizing the removal of debris to Staten Island, and overseeing its inspection at the Fresh Kills landfill.

*New York District vessel **Hocking** heading for Lower Manhattan on September 11, 2001*

The World Trade Center's twin towers aflame on the morning of September 11, 2001; the New York District headquarters at 26 Federal Plaza is in the foreground

The morning of Tuesday, September 11 began normally for New York District personnel, as it did for most Americans. At 8.45 a.m., when American Airlines Flight 11 smashed into the north tower of the World Trade Center, many employees of the district were just reaching the agency's offices in the Jacob Javits building at 26 Federal Plaza, roughly half a mile from the twin towers. Others were heading to meetings, conferences, or job-site visits around the region. North Atlantic Division Commander Brigadier General M. Stephen Rhoades was *en route* to Atlantic City, to address an annual East Coast dredging conference; a contingent of district staff was heading to Atlantic City as well. District Engineer Colonel John O'Dowd was convening a "hot topics" meeting in the district's executive conference room in the Javits building. Across the harbor, at the district's Caven Point Marine Terminal in Bayonne, New Jersey, a Coast Guard licensing class was under way involving nineteen mariners from the Wilmington, Baltimore, and Philadelphia districts as well as New York District wheelhouse personnel.

As awareness of the plane crash spread, no one knew what it might mean. Veteran staff members recalled the unsuccessful effort to topple the towers in February 1993, when six people were killed by explosives packed in vehicles parked in the underground garage. Some district personnel just turned around in their tracks and went back home. Others headed on into work, especially those for whom the looming end of the federal fiscal year meant a heavier than usual press of business. Opinions varied. Was it a small plane? Could it have been unintentional? Was it terrorism?

United Airlines Flight 175 flew into the south tower a quarter of an hour after the American Airlines jet hit the north tower. Word spread quickly of the second crash, which was visible from offices on the south and west sides of the Javits building, and hope vanished that the first had been merely a horrendous accident. District staff and other federal employees began streaming out of the building. A bomb planted by Puerto Rican nationalists detonated in the Javits building in 1982 and since then the building had been the target of numerous terrorist threats. The FBI was located in its upper floors, and a major terrorism trial was under way in a nearby court building: it was reasonable to fear that 26 Federal Plaza could also be a target of whatever violent assault was taking place that morning. When district personnel reached the streets they found them clogged with confused and frightened people, and many district employees were not far from the building at 10:05 a.m. when the great rumble was heard of the south tower collapsing. The air immediately filled with a cloud of dust, soot, and pulverized building material.

The moment of collapse of the Trade Center's south tower

Boats assembling to assist with the evacuation of Lower Manhattan, among them New York District vessels

Corps of Engineers personnel across the harbor at Caven Point, who were watching when United 175 flew low over the water and into the south tower, sprang into action before they received any official order to mobilize. The district's marine dispatcher sent the survey ship *Hatton* into the harbor to see what it could learn. By the time the north tower gave way just before 10:30 a.m. all of the available district vessels were staffed and ready to go.

Amid rumors of people leaping into the Hudson and reports of throngs gathering at the southern tip of Manhattan Island, a call came from the Coast Guard's Captain of the Port for all vessels in the harbor to report to the Battery. The *Hatton* was already in the harbor; district vessels *Driftmaster*, *Gelberman*, *Hudson*, and *Hocking* had cast off their lines and were steaming out of the channel when the call came. The *Hayward* was under repair, its steering gear disassembled. But the contractor had begun putting it back together at the first sign of trouble, and the vessel was in operation by mid-morning; when it left the terminal its crew consisted of one mate and five captains. The district also mobilized the Environmental Protection Agency vessel, the *Clean Waters*, which is berthed and maintained at Caven Point.

When the ships reached the lower tip of Manhattan they found bedlam. Vessels of all kinds – commercial tugs, ferry boats, park service ships, police department craft – pulled in wherever they could. They took on stunned and frightened people and ferried them to Ellis Island or the Jersey Central Railroad Station at Liberty State Park in Jersey City where triage centers had been established. Other temporary holding areas were later set up near Exchange Place and in Hoboken.

Although no one was in charge, the ships' captains who were accustomed to radio contact with one another, quickly figured out what to do. As the New York City Police Department struggled to get control of the quays, the various boats sorted themselves out. They lined up along the Battery from South Street on the East River all the way round to North Cove, near the World Trade Center complex, the site that everyone would soon be calling Ground Zero. Some ships affixed sheets to their bows with destinations spray-painted on the sheets: Brooklyn, Jersey City, Staten Island, etc. General Rhoades compared what he observed at the Battery to what he knew of the evacuation of Dunkirk in 1940 when hundreds of thousands of French and British troops were evacuated from beaches in northern France by a miscellany of yachts, motorboats, fishing craft, and other vessels. Others called it an armada.

Gradually the main point of departure for the ferrying operations shifted from the immediate vicinity of the World Trade Center to the Chelsea Piers where thousands congregated who had moved north out of the immediate vicinity of the attack. Crowd size is difficult to estimate under any circumstances, but on a day as chaotic as September 11, any number must be a rough approximation. By 9:00 p.m. or 10:00 p.m., when the evacuation of Manhattan was essentially finished, perhaps 3,000 people, most covered with a fluffy, gray-white dust, had been ferried from Manhattan to Ellis Island, Jersey City, or Hoboken on district vessels. On their return trips to Manhattan the ships brought firefighters, search and rescue teams, and other first responders. A tugboat carrying roughly one hundred evacuees called Caven Point asking permission to tie up there – it carried so many passengers that its draft was too deep for other piers in the area. The district accommodated the tug and its dusty human cargo disembarked.

As the day wore on, the crews on the New York District vessels did less ferrying of people and more supplying of goods. The Gelberman took water to North Cove adjacent to the World Trade Center site. The Hayward became a fuel supply ship. First it tied up alongside the Harvey (a retired fireboat slated to become a floating museum that had been called back into action), which was moored at North Cove, and transferred to it roughly 1,000 gallons of fuel. The Harvey was not fighting fires directly. It was pumping water through large hoses to the pump trucks on the ground, because all the water mains in the vicinity were out. It wasn't only the Harvey that needed fuel. The fire trucks actually throwing water onto the smoldering heaps of the former towers and the adjacent burning buildings could not leave to refuel because they were hooked to the hoses. To remedy this, the crew of the *Hayward* rounded up all the containers they could: fuel cans, five-gallon buckets, even water jugs, which they filled with fuel and then delivered to the fire trucks. In the spirit of makeshift enterprise that characterized the entire emergency response to the disaster, the *Hayward* crew duct-taped rubber gloves to the mouths of jugs that lacked lids.

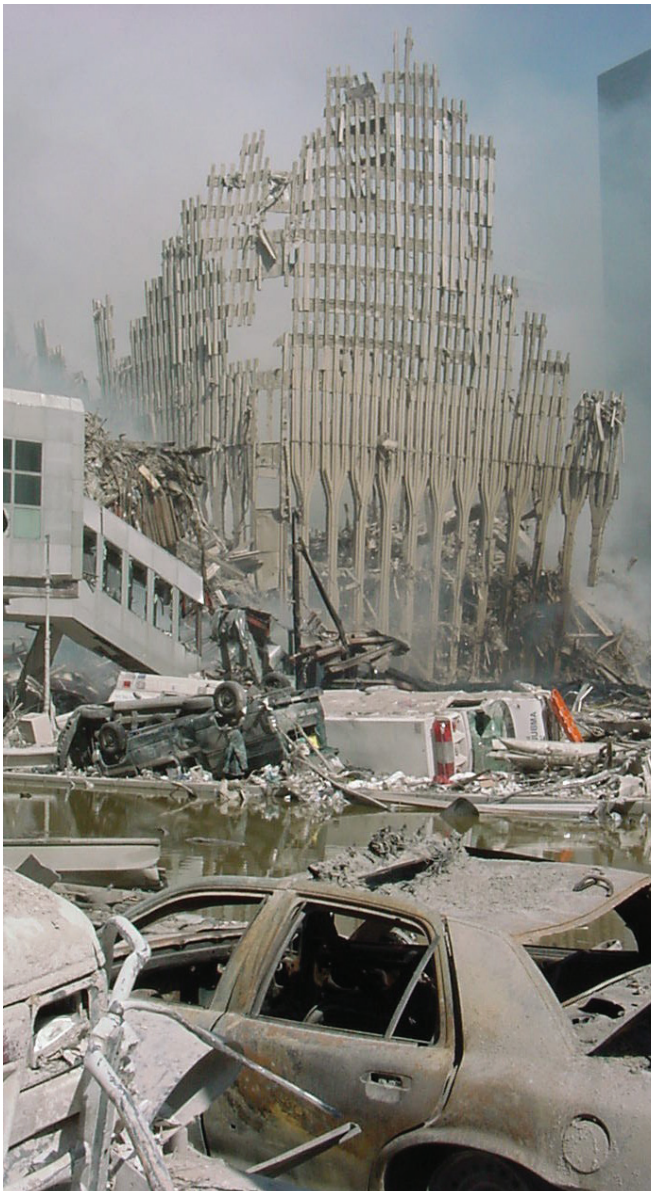
Getting the fuel containers from the seawall where the *Hayward* tied up to the trucks fighting the fires was also a challenge. The fire department had no hands to spare. On some trips a pickup truck was available; at other times, golf carts from the Battery Park City maintenance operation, and even hand trucks, were drafted into service. For the first day they worked a twenty-four-hour shift. After that the crews changed every ten hours or so, with the *Hayward* continuing in operation for three consecutive days without respite. The other district vessels pushed equally hard. With all the debris that had been blown into the water, propellers were getting damaged and sea strainers clogged. Maintenance crews at Caven Point were busy keeping the boats operating. They worked long shifts, staying at the terminal for days at a time.

Unsolicited supplies for the rescue work at Ground Zero started arriving at Caven Point on September 11, and continued for weeks. Organizations from all over the country got together to send whatever they could. Their trucks arrived with a range of items such as water,

With hydrants out of commission, water hoses were run along streets from pump trucks to Ground Zero

gloves, masks, oxygen, and acetylene fuel tanks. The Caven Point operations developed an informal system of supply, transporting materials as they were needed. For example, when the *Hatton*'s crew heard over its radio that emergency responders needed respirators at Ground Zero, they headed to the Caven Point pier, loaded up with respirators, and delivered them to the North Cove, as close to the site as they could get.

The New York City Police Department began thinking about debris removal from Ground Zero within a few hours of the towers giving way. The city's Office of Emergency Management decided very quickly to re-open the recently closed Fresh Kills landfill on the west shore of Staten Island, where cranes and other equipment were still in place. Removal of debris by truck to Fresh Kills, twenty miles away, was under way by the late afternoon of September 11. It soon became evident that it would require tens of thousands of truckloads to clear the site –



Ground Zero

an additional burden the roads of New York, Brooklyn, and Staten Island could hardly be expected to bear. Reached by the Coast Guard in the afternoon, Colonel O'Dowd was called to a meeting to discuss alternatives to trucking set for that night at the city's makeshift emergency operations center in PS (public school) 89 on West Street, just north of the World Trade Center site.

Conditions at Ground Zero on the night of September 11 were chaotic. Phone service was intermittent at best. General Rhoades, the first senior Corps of Engineers staff person to view the site, managed to get a call to his superior Lieutenant General Robert B. Flowers. "This is the scope of Pearl Harbor," he told the Chief of Engineers. It was not clear who, if anyone, was in charge of the mountain of twisted steel and smoldering grey-white powder at the site. That evening Colonel O'Dowd found his way with some difficulty – the streets were knee-deep in office paper – to the meeting convened in PS 89. The assembled group decided that since a barge could carry the equivalent of thirty to thirty-five truckloads of waste, barging the debris from Manhattan would be far better than trucking it. Before the meeting broke up, those in attendance briefly discussed the steps to be taken on the following day, Wednesday, September 12, to get the barging organized.

It took a few days before real command and control were developed at Ground Zero, but the Corps of Engineers began working with the Federal Emergency Management Agency (FEMA) to organize its response immediately. Because FEMA's New York office (in the Javits building like the district offices) was inaccessible, it set up temporary headquarters at Camp Kilmer in Edison, New Jersey. By noon on September 11, a few New York staff members were there to lend assistance. The district team grew to four on Wednesday, and for three days they worked with FEMA arranging crucial aspects of the response, including the deployment of the 249th Engineer Battalion (Prime

September 11, 2001:
A Map of Critical Locations

Power) and debris management teams from Baltimore and Mississippi. They helped the New England District relief team get settled in, worked on the loan of emergency command and control vehicles, and helped coordinate the district's boats ferrying relief workers around the harbor, before reporting to the district's emergency management operation at its temporary base at Caven Point.

In the aftermath of the tragedy the New York District was largely incapacitated because lower Manhattan was declared off limits to all but emergency rescue personnel. It had no reliable means of communications, its staff was scattered, and many employees were preoccupied with the safety of their friends and family. The district itself experienced no casualties when the towers were hit. However, Henry "Bud" Kiefer, a long-time district engineer technician, lost his twenty-six-year-old son Michael, a New York City firefighter for scarcely nine months, when he was killed in the towers' collapse. Out of respect for Michael Kiefer, and all New York City firefighters, the district adopted a method to provide support for the New York City Firefighters Burn Unit. In partnership with

Land's End, the district created clothing and apparel with its name. For each item purchased, a donation was made to the burn unit in memory of Michael Kiefer.

Since the offices at 26 Federal Plaza were inaccessible (they remained closed until late September), General Rhoades had no choice but to declare New York a victim district. This principally meant the district was not in a position to manage the Corps of Engineers' emergency response/recovery office. This assignment went to the New England District under Colonel Brian Osterndorf. A team from New England arrived in New York City on September 12. Osterndorf's mission was twofold: he was designated the North Atlantic Division commander (forward) with orders to act as the division leader on the ground; and he was to establish an emergency office that would do whatever was asked of the Corps of Engineers by FEMA, New York City and New York State. Within a few days Colonel Osterndorf, operating from the emergency operations center set up at Pier 90, was overseeing more than one hundred Corps of Engineers experts in rescue and recovery who represented every district and laboratory in the country. The New York District's mission, meanwhile, consisted of reconstituting itself by accounting for its personnel, awarding contracts before the end of the federal fiscal year on September 30, and helping out as best it could with emergency response and cleanup operations, on a case by case basis. New York City and FEMA, for example, both adopted the district's Global Information System data for security and site planning purposes.

9/11: THE TALLY OF DESTRUCTION

The Human Cost

2,823 people were killed in the attacks on the World Trade Center. Among the dead were 343 New York firefighters, 37 Port Authority police officers, and 23 officers from the New York City Police Department. The physical remains of 1,102 victims were identified; 289 bodies were recovered.

Buildings Destroyed and Damaged

Totally destroyed: 1 World Trade Center and 2 World Trade Center (the twin towers); 3 World Trade Center (Marriott Hotel); 7 World Trade Center; and the Greek Orthodox Church of Saint Nicholas. *Partially destroyed (later demolished):* 4, 5, and 6 World Trade Center; and 130 Liberty Street. *Structurally damaged:* the Winter Garden; Two and Three World Financial Center; the Verizon Building; 30 West Broadway; 90 West Street; 130 Cedar Street; 184 Broadway; and the southern extension of 130 Liberty Street. *In need of repair:* Embassy Suites on Vesey Street; and 14 other structures. *Requiring cleanup:* more than 60 buildings.

In total, 15.5 million square feet of office space were destroyed, including 10 million in the twin towers; 1.62 million tons of debris were removed in 108,342 truckloads; 3.1 million hours of labor were spent on cleanup.

As the days wore on various state and federal agencies became more aware of what the Corps of Engineers could provide. With the city's bridges and tunnels closed, ground transportation in the region was almost impossible, and the district floating plant was in great demand. The cranes on the district drift removal ships were used often for moving heavy equipment. Other vessels from Caven Point not only fueled the fire trucks, they supplied lubricant oil, antifreeze, medical supplies, and dust masks. They picked up tools for those excavating the debris pile at Ground Zero; and they moved people to and from the site – firemen, urban search and rescue teams, doctors, emergency medical technicians, and, even after the bridges and tunnels reopened, many visiting officials and dignitaries.

For the first week or so it was difficult to say who at Ground Zero was operating under orders and who was just doing what needed to be done. On September 12, iron and steelworkers showed up and started working. Their skills along with the ingenuity of Corps of Engineers structural experts enabled the fashioning of wrecked steel into bridge girders on which a crane could move over the debris. On Friday, September 14, President George W. Bush instructed executive agencies to allow employees affected by the attacks to take excused absences without losing leave or pay. From Wednesday through Friday, however, many district employees had been finding their way to Caven Point in New Jersey, or Fort Hamilton in Brooklyn, or an area field office, ready to do their jobs or pitch in any way they could.

While Colonel O'Dowd set about reconstituting the district, the near frantic rescue effort continued at the pile, as the devastated site came to be called. Roughly 100 to 120 truckloads of debris were taken to the Fresh Kills landfill on Staten Island on each of the first few days, and a debate developed over how to dispose of the structural steel. Some argued the cheapest and quickest thing would be to put it in the ocean at one of the artificial reefs off the Long Island or New Jersey coast. The material could be put into bottom-open barges, shipped out to sea, and dumped. But no one could say for sure that no contaminants were affixed to the steel, which the steelworkers were cutting into manageable pieces, and this idea was rejected. For the next two weeks the steel went with the other debris to the landfill where it was stacked before a recycler from Jersey City hauled it away. Later it went directly from Ground Zero to the recycling depot, and a forensics team from the American Society of Civil Engineers examined some samples to assess the steel's performance during the fires.

Debris removal at Ground Zero

Meanwhile those working to arrange for barging the debris chose Pier 25, just north of Stuyvesant High School, as the closest location where a barge could actually be loaded and a truck could move back and forth between Ground Zero and the harbor. But the pier could not accommodate the deep-draft barges that were needed to move the debris. In fact, New York City had no deep-water access anywhere in lower Manhattan. To use Pier 25, dredging would be necessary, and to dredge a permit was required, even under these exigent circumstances. District personnel expedited the process to a remarkable degree. Despite a debate over how to dispose of the dredged materials, they succeeded in issuing a permit within twenty-four hours.

The debate concerned whether these emergency circumstances warranted dispensing with the usual environmental standards. Some wanted to dump dredged material from Pier 25 directly into the ocean. But others objected that the material had not been tested, and PCBs, heavy metals, and other pollutants were likely to be present because they had previously been detected nearby. Fortunately an alternative was available. A quick estimate suggested the need to remove roughly 120,000

Clamshell dredge at work at Pier 25

World Trade Center debris en route to Staten Island at Pier 25

cubic yards of material to get to the required sixteen-foot channel depth alongside the pier. New Jersey, working with the Port Authority, offered a containment pit in Newark Bay where the material could be placed and capped with clean sand. This took only twenty-four hours to arrange, and using an existing dredging contract with Weeks Marine, a clamshell dredge was on location setting its crane and ready to drop its spuds the moment the approval came through. No sooner did Weeks get the call to commence operations, however, than they discovered the dredge was sitting in a field of pilings from an old wharf. Instead of mud, the scoop was bringing up pylons and pieces of rotting piers.

There was no time to spare. While, sadly, no one was found alive after Wednesday, the firefighters and other rescue workers had not given up their search. The dump trucks could not keep up with the supply of rubble that the desperate search for survivors was generating, and the need for barging was growing by the day. Quickly the involved parties found a solution. Dredging went ahead as planned, round the clock, with an inspector present at all hours. Everything pulled up went into disposal scows which took the dredged material to the containment pit in Newark Bay where the district kept a drift removal vessel at the ready. After the scows dumped their loads, the drift vessel picked up whatever had floated to the surface.

When the ship finished at the disposal site it headed to Pier 25 to collect any floating objects that had escaped during the dredging. All this material was later disposed of as if it were collected during the district's regular drift collection operations. The emergency dredging proceeded in this manner without interruption and without creating a hazard to navigation. During this operation the *Driftmaster* stayed in the harbor round the clock with changes of crew being periodically ferried out to it. Within a week the contractor finished dredging and the barging of World Trade Center debris commenced from Pier 25.

The cleanup operation at Ground Zero was divided into four quadrants, each with a different lead contractor responsible for removing debris from that quadrant. The contractors on the south side of the pile were unable to get their trucks to Pier 25, so a second location where barges could be loaded was set up at Pier 6 on the East River, the site of the Port Authority heliport. But it too required dredging, and this went even faster than the Pier 25 job. Corps officials found a contractor working in Boston harbor for the New England District who was able to get a dredge to New York in thirty-six hours. But not before a crisis was narrowly averted.

While the dredge from Boston was heading to New York, the district received a call from a company that managed One New York Plaza, a fifty-story office building located at the very tip of Manhattan, the southernmost skyscraper on the island. The management firm in charge of the building was concerned about a cooling system intake pipe that extended into the dredging area. If the pipe were damaged, or if the water became too turbid from being stirred up by the dredging, it could shut down the building. Because One New York Plaza housed a number of major financial institutions, there was a considerable incentive to keep it open. Keeping the financial services industry running was an important part of the message of resiliency that New York was trying to send on behalf of the nation. The pipe in question did not appear on any of the permit drawings, all of which the district thought it had seen. They knew, for example, about a subway tunnel that ran under the proposed dredging area, and had figured out how to work around it. No one was aware of the problem until a representative from the management company appeared with a drawing that showed the pipe had been relocated impermissibly. A hastily called meeting enabled the dredging operations to accommodate the newly discovered pipe, to the great relief of all involved.

No sooner was this settled than something else was noticed on the recently presented drawing that did not appear on any of the other documents: a forty-eight-inch storm sewer seemed to come out of the bulkhead. It was in the wee hours of the morning before all involved parties had been contacted about this. Not long after dawn, dye was put into the sewer and flushed through it with a hose. This exercise showed that the sewer line discharged flush with the bulkhead, meaning there was no pipe in the area. With questions about both One New York Plaza and the storm sewer resolved, dredging got under way. It concluded on October 4.

Not only did the dredging for Pier 6 avoid the closure of an important financial district building, it contributed to the return to operation of the financial district in another way. With the assistance of the 249th Engineer Battalion (Prime Power), the Consolidated Edison Company of New York (Con Ed) installed a number of large transformers to temporarily replace the electrical power that was lost when lines under the twin towers were destroyed. These transformers were brought to Pier 6 and, with a large crane, lifted over the FDR Drive, lined up underneath it, and then wired into the grid.

In the aftermath of September 11, the region needed additional ferry service because the loss of the Port Authority Trans Hudson (PATH) trains meant roughly 50,000 to 60,000 commuters lacked a means of travel between New York and New Jersey. This led to another dredging issue that involved the district. The existing ferry terminal, Pier 11 in lower Manhattan, could not handle the added traffic and the next two preferred locations – Pier 79, on the west side around 38th Street (directly over the Lincoln Tunnel) and Pier 8 at the very tip of Manhattan – both required dredging. The district worked with New York City and FEMA to expedite these permits, but the

Barges being loaded with World Trade Center debris at Pier 6 circumstances were not as urgent as they had been with the barging permits so there was room for more debate over what to do with the dredged material. The disposal pit in Newark Bay could not take much more than the 120,000 or so cubic yards from the Pier 25 work, but a satisfactory, even beneficial, use was found for the material from Piers 8 and 79. Mixed with cement and fly ash (a residue of crushed-coal combustion at power plants), it was used to cap a landfill in Brooklyn.

Reconstituting the district may not have been at the center of the recovery effort where its personnel most wanted to be, but it was not a simple task. Colonel O'Dowd asked all office chiefs to account for their staffs, which turned out to be a challenge in itself. Personal address books tend to be out of date. Official personnel records were in the federal building, which was shut. If supervisors had contact lists at their homes, they were often incomplete. The 800 emergency number the district had established was out of service, along with all the phone lines in the area, and it took a few days to get another in place for employees to use to contact the district. Public service announcements were run on local radio and television stations asking district employees to call the new number, but to little effect. By Thursday, September 13, almost everyone was accounted for. The last few people were located over the weekend when district staff visited neighborhoods and knocked on doors to find them.

On Friday, September 14, a small explosion rocked the Kill van Kull, the result of a delicate problem the district had solved. On the morning of September 11 a district contractor had been in the Kill van Kull preparing to blast for the New York-New Jersey Harbor Channel Deepening Project. Explosives were in place ready to be detonated when the Coast Guard ordered the contractor to stop work, about an hour after the towers were hit. Discussions with the Coast Guard and New York City's fire department and emergency operations office led to a decision to postpone the blast and avoid causing any unnecessary fear about further terrorist assault. So the barge sat there while a discussion ensued about when it would be permissible to blast, and whether or not it would be better to notify the public in advance. On Friday when the Coast Guard authorized the detonation it was done without issuing an announcement. It was a relatively small explosion and no complaints were heard until some criticism of the decision not to notify the public reached the district a few months later.

Getting everyone back to work and in a frame of mind to do their jobs effectively was another challenge. Colonel O'Dowd held town hall meetings at Fort Hamilton, Caven Point and some other locations to set the tone, and people began setting up work places wherever and however they could: at area offices, at Caven Point, at contractors' offices, even in private homes; overcoming the lack of telephones and fax machines, e-mail, meeting space, and so forth. Staff members were in particular need of bases where they could do fiscal year-end work on millions of dollars worth of contracts. Many crammed themselves into Division headquarters at Fort Hamilton. The district's Operations Division set up at Caven Point. On Saturday, September 15, personnel from the Information Management Office went into the district's office at 26 Federal Plaza where the dust in the building was so thick they could not see from one end of a hall to the other. They dismantled, packed, carried, loaded, unloaded, set up and reconfigured more than sixty desktop computers, computer-assisted design (CAD) workstations, servers, and printers. They established communication links, installed hubs, and created networks, first at Fort Hamilton, then at Caven Point. A contract for a $10-million physical fitness center at McGuire Air Force Base was hammered out on a picnic table at Fort Hamilton. The Engineering Division rotated personnel on CAD stations at Caven Point around the clock to complete design amendments for the Battle Simulation Center at Fort Drum. Beside its work on end-of-year contracts, the real estate office had to find alternative locations for two recruiting stations in the "red zone," as the restricted area around Ground Zero was called. Altogether roughly fifty contracts worth nearly $60 million were awarded before the end of federal fiscal year 2001.

As far as the recovery effort itself went, for nearly three weeks the New York District remained in a supportive role. It took on specific missions such as operating the drift removal vessels in support of the dredging, and it worked with the North Atlantic Division and the New England District team on media relations. Crews from Caven Point remained busier than usual. They continued collecting debris, moving equipment and material, transporting various work crews, politicians, and other dignitaries to and from Ground Zero. They also moved district personnel to and from Fort Hamilton. The demand on the district's fleet was so great that early in the second week after September 11 the New England District brought two of its vessels into the harbor where they were kept busy until the end of the month.

*The **Wampanoag** from the New England District lends a hand*

During the second week New York City firmed up its control over the cleanup operation. There were more than 1,000 workers using 120 pieces of heavy equipment at Ground Zero, and 240 trucks and perhaps as many as seventy barges were moving roughly 10,000 tons of debris a day to Staten Island where another 145 pieces of equipment were at work. The Corps of Engineers began reducing its out-of-district presence. Some of the search and rescue teams and many engineers left, though some stayed on because of structural concerns about the debris pile and the slurry wall, or as some people were calling it, "the bathtub." The twin towers, whose foundations lay quite close to the Hudson River bank, were built inside a tub designed to ensure that the river did not push its way into the towers' basements. Throughout the debris removal process a careful eye was kept on the western wall of this tub, and a variety of efforts were made to shore it up.

The 26 Federal Plaza office building re-opened in the last week of September, but most district staff postponed their return until the fiscal year-end work was done; only those district employees who were not working on year-end contracting moved back in. They found roughly 15 percent of the phone lines working. The next week 200 more district personnel joined them. Most of the phones were working in early October, and the Information Management Office staff brought the servers back from Fort Hamilton and Caven Point and reconnected them. By the second week of October, roughly a month after the attack, the entire Javits building workforce was back in its offices. Transportation to and from lower Manhattan remained challenging, however, and the smoldering pile at Ground Zero emitted an indescribable odor that irritated noses and throats for weeks, causing concern to health officials about long-term risks.

In early October New York District personnel began replacing the New England staff who were working with FEMA at its operations center at Pier 90. This redeployment went slowly because great care was taken to ensure a smooth transition. In mid-October, roughly a month after the attack, the district's emergency management branch was fully operational. By then, New York City was completely in charge of all aspects of the cleanup and fewer than forty Corps of Engineers personnel from outside the New York District remained in New York. Most were debris removal specialists and they would soon depart.

Before that transition was complete, however, the district received its major recovery mission. The New York City Office of Emergency Management, which was in charge of the overall disaster recovery operation, turned to FEMA for help at Fresh Kills, and FEMA asked the district to run the operation. This work took place off stage and did not get as much attention as the debris removal at Ground Zero, but Major General Robert Griffin, the Corps of Engineers' Director of Civil Works, called it the most important contribution the Corps made to the response to the September 11 attacks.

As sensitive as the debris removal job was at the World Trade Center site, the work at Fresh Kills, a 3,000-acre site of which 174 acres were used for this operation, may have been more delicate. At Ground Zero, debris was inspected carefully for evidence of human remains, but the operation gradually turned into a more conventional excavation and cleanup job (referred to by a structural specialist from FEMA as "pick up sticks"). In contrast, the "hill," as the operation at Fresh Kills was known, was more of a crime scene. A myriad of law enforcement officials went through the debris cubic inch by cubic inch looking for potential criminal evidence from the planes, as well as for human remains and possessions that might assist with victim identification. While the Fresh Kills mission was not formally assigned until October 1, the Corps of Engineers had been anticipating it and had invited Phillips and Jordan (P&J), a Knoxville-based contractor with a large disaster recovery unit, to New York around September 20 to assist.

P&J was the Corps of Engineers' regional advanced contracting initiative service provider. Through this arrangement the Corps ensures that a disaster recovery contractor (selected through a competitive bidding process) is available in every part of the country. For an advance initiative contractor to be deployed, a scope of work has to be developed, cost estimates worked up by the contractor, and task orders issued. Thus, while many district employees were winding down their strenuous work on the weekend after the year-end closeout, and preparing for the move back to their offices at the beginning of the next work week, others were busy drafting the advance contract initiative documents and negotiating with P&J.

During the week when P&J observed the Fresh Kills landfill operation they saw a command post of about ten trailers operating under the New York City Office of Emergency Management. A joint terrorism task force of the New York City Police Department and the FBI was running the criminal investigation, and the New Jersey National Guard provided medical support. There seemed to be no overall site management plan. Five contractors and volunteers from police departments from near and far were assisting the task force. Each agency was operating its own health and safety program. There were six or seven portable

Power shovel offloading debris at the Fresh Kills landfill

Backhoes load debris into sifters at the Fresh Kills landfill on Staten Island

toilets for the entire operation, and poorly managed feeding facilities. Using bucket loaders, crude shakers, rakes, hoes, and shovels, workers were picking through 3,000 to 5,000 tons of debris daily, less than what was arriving each day from Manhattan. Unprocessed debris was building up in two large stockpiles. One, consisting of material that came from buildings with federal tenants, was for the FBI to inspect. The other was handled by the New York City Police and Corrections departments.

When P&J got started, there were twenty-four public agencies on the hill – federal agencies like FEMA, the Occupational Safety and Health Administration, and the FBI; state agencies like the New York State Department of Environmental Conservation and the state police; and New York City agencies like the departments of sanitation, emergency management, police, and corrections. It was an emotionally charged atmosphere. Proceeding cautiously, P&J and the district tried to create a climate of respect and cooperation. They convened operations meetings every morning at which agencies were encouraged to air their concerns. Efforts were made to resolve all new issues on a daily basis, and this contributed greatly to the smoothness of the operation.

The first task undertaken by the district and P&J was the setting up of a rigorous safety program. City, state, and federal agencies all collaborated on the Site Health and Safety Plan, under which workers inside the processing area were required to wear Tyvek suits as well as eye,

Tyvek-clad workers inspecting debris at the Fresh Kills landfill

Sorting of debris went on day and night ear, and head protection. The equipment took an hour to put on and take off. Every worker got a safety orientation before each shift as well. These strenuous efforts were credited for the Fresh Kills work maintaining a remarkable safety record. There were 750 to 1,000 workers on the hill at its busiest. It ran round the clock for many months. Roughly 1.7 million man hours were expended on the 160-acre site. Huge pieces of heavy equipment operated extremely close to smaller vehicles and in many cases close to people on foot. Yet there was only one accident serious enough to be classified as a "lost time" event, and this was caused by a wind-blown picnic table.

After safety P&J attended to logistics. The site required generators for electricity; it did not have running water, so water had to be trucked in. Mess facilities were provided by the Salvation Army. In less than four weeks, work conditions had improved noticeably, the backlog of debris was cleared, and cooperation was building among the various agencies from the three different levels of government.

This was a unique operation in three important respects. In a typical disaster, debris is hauled directly from the site of destruction to a landfill for disposal. In this instance the debris was inspected, moved, and inspected again – the second time exhaustively by law enforcement personnel – before its permanent disposition. The second distinctive aspect of this job was the debris itself. In the disasters with which P&J and the Corps of Engineers were familiar, the debris was typically limbs of trees, pieces of houses or utility poles produced by hurricanes and floods. Much of the Ground Zero debris, in contrast, was powdery rubble that had been pulverized, burned, and compressed. There was ash, of course, but also a good deal of sand and gravel, the constituent ingredients of concrete and glass. Third, the entire area was technically a crime scene. Every small piece of debris was being inspected for human remains and potentially valuable forensic evidence.

The biggest technical challenge was organizing the processing. The New York City Department of Sanitation was in charge of moving the material. The police department and the FBI, in conjunction with other law enforcement agencies, controlled the inspection. The job of the Corps of Engineers and its principal contractor was to make all the parts fit together. The system they established eliminated the segregation of material by place of origin. Debris was removed from barges (and trucks until late November) as it had been when the landfill was open. Massive forty-five-ton trucks hauled the material up to the top of the landfill and dumped it. Processing involved two separate sorting operations so the material ended up in three different categories. When the trucks brought the debris up the hill from the marine transfer station it was laid out in piles adjacent to hydraulic hoes with grappler hooks and buckets. The giant hoes with their hooks carried out "metal scalping" in which large pieces of metal were pulled and laid out on an inspection field where teams of detectives then pored over these items in search of criminal evidence, human remains, and personal property. Human remains were taken immediately over to a temporary morgue. Personal property was taken to an evidence trailer. After inspection the heavy metal material was hauled off the field to a bank from which a recycling contractor recovered what could be re-used; the rest was buried in the landfill. In addition to processing debris, hundreds of damaged vehicles, many from the police and fire departments, were moved to Fresh Kills. These vehicles were documented, searched, cleaned, and shipped for disposal.

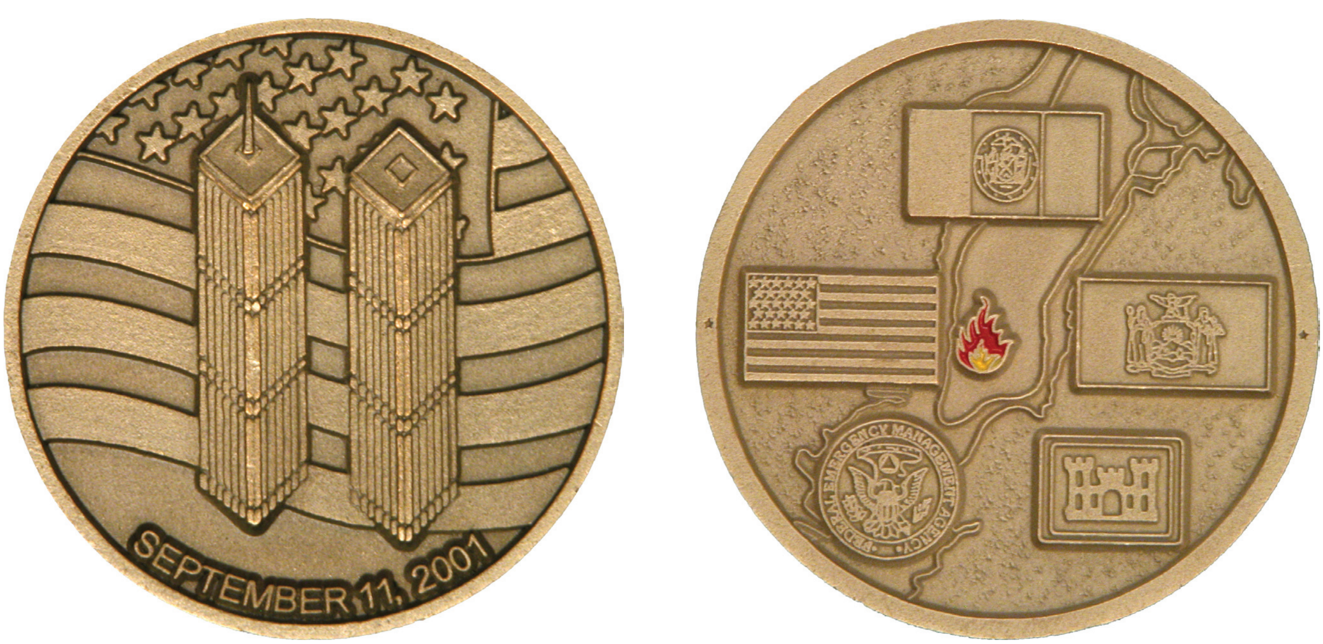
The remaining debris was put through shakers that sorted it into two categories: light metals and mixed debris. Light metals actually included not only metal but concrete, aggregate, and anything larger than roughly eight inches. Mixed debris consisted of everything smaller. The light metal was treated like the heavy metal and spread out on an inspection field for detectives working with rakes and shovels. When the detectives were done, the light metal was hauled off. The mixed debris was put through power screens that separated it into ever smaller pieces, which were put on variable-speed conveyor belts operated by the detectives doing the inspection work. In the busiest months there were five conveyor belts operating, and it was then that the inspectors got a good look at the smallest material, pieces as small as fractions of an inch. In total, roughly 1,550,000 tons of debris were removed from Ground Zero and processed at Fresh Kills. Inspectors found hundreds of forms of identification such as drivers' licenses, credit cards, and other documents. All told, including shoes, books, wallets, jewelry, and clothing, approximately 90,000 pieces of personal property were collected, along with human remains. This enabled the identification of over 150 victims, nearly 15 percent of the total identified.

On May 30, 2002, eight months and nineteen days after the attack, a flatbed truck carrying a fifty-ton steel column shrouded in black drove from the World Trade Center ruins after a brief and somber ceremony that marked the end of the Ground Zero cleanup. The work at Fresh Kills went on for another six weeks, until July 15. A formal closing ceremony was held on September 15. The contractors, government agency representatives, police personnel, and volunteers on the hill did not stop looking for human remains and personal possessions – anything that might bring comfort to a bereaved family – until the last cubic inches of debris were inspected.

Ceremonial end of cleanup at Ground Zero

Many senior district staff members received the Commander's Award for Civilian Service for their outstanding efforts in the aftermath of 9/11, and it was members of the New York District staff who received the John William Morris Civilian of the Year award in both 2002 and 2003. Numerous other district employees were bestowed with honors for their September 11 work. Over one hundred staff members received a Department of the Army Civilian Award for Humanitarian Service. The entire district put forth a Herculean effort and each individual award represented the accomplishments of an entire team.

The district distinguished itself in many ways in the aftermath of 9/11, but three stand out. First, it reconstituted itself in the face of very difficult circumstances; second, despite inadequate office space, and a lack of telephones and computers, it successfully completed work on tens of millions of dollars worth of contracts before the end of the fiscal year; and, third, it oversaw the extraordinary debris inspection and removal operation at the Fresh Kills landfill, which safely and efficiently processed thousands and thousands of tons of rubble, inspecting the tiniest fragments for criminal evidence and human remains. In every respect, in resuming their daily activities and pressing on with the projects and programs of the Army Corps of Engineers, all district employees, especially those who worked at 26 Federal Plaza, contributed vitally to the recovery of lower Manhattan and the recuperation of the nation. As Ernest Hemingway put it in *A Farewell to Arms,* "many are strong at the broken places."



Obverse and reverse of the coin issued by the North Atlantic Division to commemorate September 11, 2001

Sources for Chapter 9:

Much has been written about the events of September 11, 2001 and their aftermath, of which it was feasible to read only a very small amount. The Office of History, Headquarters, U.S. Army Corps of Engineers, conducted a number of interviews with people from the New York and New England districts, the North Atlantic Division, and Headquarters who were involved with the Corps' response to the disaster. Particularly helpful were interviews with Brian Aballo, Thomas Creamer, Alan Dorfman, Kingsley Findlay, Elizabeth Finn, Timothy LaFontain, Richard Gaudreau, David Leach, Edward Nerges, Colonel John O'Dowd, Colonel Brian Osterndorf, James Parks, Abraham Portalatin, Brigadier General Stephen Rhoades, Joseph Seebode, and John Wilbur. These interviews are archived at the Office of History, Headquarters, in Washington, D.C. The formal interview the author conducted with Thomas Creamer, Chief of the District's Operations Division who was working at the North Atlantic Division on September 11, was especially helpful, as were many informal conversations with district staff about their experiences on and after the day of the attack. The Creamer interview is archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77. The district's extremely thorough "*World Trade Center 9/11 Response and Recovery After Action Report*," released in June 2002, was helpful as well.

A remarkable series of brief essays by Jonathan Schell called "Letter from Ground Zero" appeared in *The Nation* on October 15, October 29, November 5, November 12, November 19, November 26, December 10, and December 24, 2001. In addition to these, articles in the *District Times*, and the extensive coverage of the disaster by the New York Times, the following sources were particularly informative.

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Epilogue

The three decades between 1975 and 2005 were eventful – internationally, nationally, and locally. Changes taking place in each of these overlapping realms fundamentally shaped the work of the New York District of the U.S. Army Corps of Engineers.

Internationally, the Vietnam War drew to a close, the Cold War ended, and the United States engaged in its first serious post-Cold War military undertaking in the former Yugoslavia, which district staff supported by deploying to both Kosovo and Macedonia. These events, all occurring prior to September 11, 2001, prompted wide-ranging changes in the American military that the New York District helped implement. The leveling of the twin towers of the World Trade Center by terrorists on 9/11 horrified the country and had a searing effect on the district. The New York District played a vital role in the immediate aftermath of the attack and continues to maintain a close involvement in the safe and secure operation of the nation's premier East Coast port.

Following the end of the Vietnam War, an effort to rebuild the peacetime Army resulted in increased attention to the living standards of American servicemen and servicewomen, which was reflected in the design and construction of facilities at West Point, Fort Drum, Picatinny Arsenal, and other posts within the New York District's military boundaries. The U.S. Army's commitment to the development of an excellent officer corps is reflected in the district's construction program at West Point, which has averaged approximately $30 million a year since the mid-1970s. The district's commitment to its work at West Point can be seen in the area office it maintains there, which is responsible for all engineering and administrative services at the academy.

The end of the Cold War led to the decommissioning of Strategic Air Command bases in New England, with which the district was involved, as well as a reorienting of priorities at many military facilities within the district's military boundaries. The principal means by which the Pentagon implemented changes in its infrastructure of bases and other military installations was the Base Realignment and Closure (BRAC) process. BRAC was a means the Department of Defense developed to make more efficient use of its military resources and to minimize the political challenges its decisions to close or reduce military installations would encounter. In five BRAC rounds – 1989, 1991, 1993, 1995, and 2005 – the Pentagon closed approximately 400 installations and reoriented many others.

Many posts within the New York District's military boundaries were targeted by the successive BRAC rounds. At Fort Monmouth, for example, a number of operations were reorganized to create the Communications-Electronics Command in 1991, and the BRAC initiative of 1995 further consolidated functions under the Intelligence and Electronic Warfare Directorate, Research and Development Facility. Both of these initiatives led to considerable work for the district. Expansion at Fort Monmouth continued throughout the late 1990s and up until 2005, when the BRAC process slated it for a complete shutdown.

Picatinny Arsenal, which will pick up some of the research done at Fort Monmouth, was already the Pentagon's main center of research and development of weapons and armaments before BRAC 2005. It developed roughly 95 percent of the U.S. Army's non-nuclear lethal devices. Picatinny underwent a $50-million expansion and modernization in the early 1980s, before it became the army's Armament Research, Development and Engineering Center in 1986. The district engineered the Armament Technology Facility for indoor testing of weapons and projectiles in 1995 and upgraded it for testing systems as large as the Abrams tank in 2003.

Watervliet Arsenal, rather than a research and development facility, is the Army's primary gun-tube maker, the nation's sole facility for manufacturing large quantities of large-caliber cannons, and one of the most sophisticated heavy manufacturing centers in the world. The high level of technological sophistication of the American military is illustrated by the Renovation of Armament Manufacturing project with which the district was involved at Watervliet from 1982 to 1992.

The district's work at McGuire Air Force Base, its largest and busiest military air facility, where it was twice called on to lead massive building projects to accommodate new aircraft, illustrates the increasing importance of air power in military strategy. In the 1990s the district oversaw the construction of more than twenty new buildings necessary to support twenty-four KC-10s, an aerial refueling tanker with a much larger fuel capacity than the KC-135, which it replaced. Early in the new millennium the district began a multi-building project for the C-17 Globemaster III, a strategic airlifter with a crew of three that can take off and land on a comparatively short and narrow runway and is capable of tactical airlift and airdrop missions at small airfields.

The work at McGuire was the district's second largest military construction undertaking in the late twentieth century, after Fort Drum. The Fort Drum expansion was not only the district's largest military project, it was the largest post-World War II military construction project in the nation. The Fort Drum expansion, implemented in the late 1980s and early 1990s, was the direct result of recognition by the Pentagon that the Army needed to be ready to fight enemies other than the Soviet Army.

The acts of terrorism on 9/11 not only made Americans feel less secure, they transformed the definition of national defense. The destruction of the twin towers, which were less than six blocks from the district's main office, made a profound impression on district personnel. Lower Manhattan will continue to feel the towers' loss for many years, and the many district employees who commute to work through or near the World Trade Center site are reminded daily of the brutality of the 9/11 attacks.

Immediately following the attacks the district channeled these emotions into action, working tirelessly to aid in the recovery efforts. District personnel were involved in the evacuation of lower Manhattan following the towers' collapse. They assisted in the cleanup of Ground Zero, and in the complicated arrangements to have debris barged rather than trucked to the Fresh Kills landfill on Staten Island. At Fresh Kills the district played a key role working with the debris removal contractor in bringing order to the massive site and helping make as efficient as possible the sorting of the debris in search of human remains and criminal evidence. It also took on a leadership role in implementing sensitive security projects to improve the region's preparedness. Later, many district personnel served on the two major fronts – Afghanistan and Iraq – of the "Global War on Terrorism," which the administration of President George W. Bush launched after 9/11.

Nationally, the American people changed considerably over the course of the three decades between 1975 and 2005. The wave of population movement from cities to suburbs that began after World War II continued apace, although the decline in the population of cities was slowed by the arrival of immigrants from Latin America, Asia, and Africa. As these new waves of immigration reached American shores, the United States made an increased commitment to social and cultural diversity in the workplace. The nation also digitized, and the computer and the cellular telephone became essential elements of daily life. Finally, the nation heightened its concern for the environment and called for public policies that balanced economic growth and development with the need to protect and conserve scarce resources, both natural and human made.

Both internally and in its projects, the district reflected these national changes. Internally, the workforce grew more multi-racial, and the number of women employed at the district increased rapidly. The digital revolution had a deep impact on the district. Computer-assisted design changed the work of the engineer enormously. The Passaic River Main Stem Flood Protection Feasibility Study, for example, released in 1987, was based on a sophisticated computer modeling of the river system that would not have been possible a decade earlier. Word processing made the revising and editing of reports easier; spreadsheets transformed the budget-tracking and scheduling tasks of the project manager. Telephone answering machines, and then pagers, personal digital assistants, and cellular telephones, changed the entire means by which personnel maintained contact between office and field. E-mail further transformed inter- and intra-office communication. The "Blackberry," providing cellular access to e-mail, kept senior staff connected around the clock. The environmental movement opened up entire new spheres of operation for the district. The number of biologists, earth scientists, and archaeologists employed at the district increased considerably.

The era of environmentalism had a profound effect on the district; in no area more than the issuing of permits for projects in navigable waterways. In the early 1970s projects were approved as long as they did not impede navigation in federal channels. Gradually, as concern grew for the cleanliness of the water in lakes, rivers, and oceans, understanding improved of the essential filtering role played by wetlands. Reflected in legislation such as the Clean Water and Ocean Dumping acts of 1972, the American people began calling on the government to play a role in regulating the environment. The Endangered Species Act of 1973 added protection of particular plants and animals to the environmental palette. The district had to learn new standards in the granting of permits. The controversial Westway case, in which the district was faulted for its failure to adequately assess the proposed project's impact on the population of juvenile striped bass in the lower Hudson River, highlighted the agency's growing pains in implementing its newfound environmental responsibilities.

Environmental concerns not only changed the way permits were evaluated. They also began working their way into engineering and design. The Passaic River flood diversion tunnel announced by the district in 1984, for example, involved acquiring several thousand acres of natural flood storage areas and wildlife habitat, and creating natural corridors between wetlands to ensure genetic diversity among wildlife populations. The Nepara Park/Tie-In flood damage reduction project in Yonkers, on which work began in 1994, represented the district's first serious consideration of environmental issues as a high priority in plan formulation. By the early twenty-first century the Corps of Engineers was an environmental management agency. Among the district's explicit environmental duties in 2006 were: habitat restoration or creation; brownfield remediation; hazardous waste cleanup, including Superfund sites; and water quality improvement.

Another national development that had a profound impact on the district was the Water Resources Development Act of 1986 (WRDA86), which brought local cost sharing to a wide range of water resource projects. WRDA86 limited the ability of the federal government to be systematic in national water resource policy, because instead of need alone, local willingness and ability to pay became a driving factor. It also increased the role local interests played in water resource planning, sometimes enhancing a project's political complexity, and focused the district's attention on projects for which local support was strong. The massive WRDA86, which authorized roughly $12 billion in federal spending on water resource projects, shaped a number of the district's largest projects. The bill authorized more than thirty projects in the district, eight of which, totaling $400 million in federal funds, accounting for more than half the district's total authorization in the bill, involved the New York-New Jersey harbor. Other items of significance to the district in WRDA86 included authorizations in New Jersey for the Green Brook Sub-basin flood control project, a handful of Passaic River Basin interim projects, and the Sandy Hook to Barnegat Inlet beach erosion control project.

WRDA86 also codified the emerging consensus that environmental considerations needed to be part of water resources planning. As a result, the Corps of Engineers took its place alongside the Environmental Protection Agency, the Fish and Wildlife Service, and other agencies as an element of the environmental management state. But it did so with a difference, because unlike its sister agencies, the Corps has a dual mission. It not only protects the environment, but it builds and promotes economic development too.

The principal local change that shaped the district in these years was the revival of the economy. In the mid-1970s, the economy of New York City was in very poor condition. The city had been on the verge of bankruptcy in 1974, its reputation was at a low point, and population was declining. Gradually over the following decades the fortunes of the city revived. Manhattan became the center of a revival that carried over to the outer boroughs of the city, as well as parts of northern New Jersey, Westchester County and Long Island. This economic upturn provided the background to the strenuous effort made by the district leadership in the late 1980s to increase staff pay rates to levels commensurate with the cost of living in the area.

Population growth usually accompanies prosperity, and this too provides some context for district projects. But it was not merely that the region's population increased in size in the 1980s and 1990s, it was also redistributed. Large numbers of new suburbanites moved onto floodplains in the Saw Mill River basin in New York and the Green Brook and Passaic River basins in New Jersey. This demographic shift increased the demand for flood damage reduction efforts and added to their cost and political and technical complexity. In the Saw Mill River basin, for example, the district found it necessary to redesign flood control work in Yonkers that it had built a few years earlier. Not only did more people move onto the floodplains inside the district's boundaries in recent years, but they moved closer to the ocean's edge as well. Two massive beach replenishment projects – one extending from Fire Island to Montauk Point on the south shore of Long Island, the other from Sea Bright to Manasquan Inlet in Monmouth County, New Jersey – reflect this.

The Hackensack Meadowlands in New Jersey, where the district found itself more than once trying to balance environmental concerns with economic growth, demonstrate another case where population growth shaped a district effort. After years of bypassing the vast tracts of marsh and meadows in Bergen and Hudson counties, developers began concluding that the price of land was reaching the point where the extra cost of site preparation, such as driving piles to ninety or more feet below the surface, was no longer an impediment to profitability. The district's failure to get agreement for a Special Area Management Plan in the Meadowlands was a reflection of the sometimes irreconcilable tension between environmental concerns and the need for growth and development in a prosperous economy.

Another example of how the Corps functioned at the intersection of economic growth and environmental responsibility can be found in the long drawn-out controversy that centered on the ocean disposal of material dredged from the New York-New Jersey harbor. As dredging necessary to keep the port functioning slowed down because of environmental concerns, some business was lost to the port – in 1996, 90,000 containers were diverted elsewhere, and in 1997 more than 125,000 experienced the same fate. The controversy between environmentalists and shipping and other business interests grew so intense that the threat of violence hung over public meetings on the subject and it took the intervention of Vice President Al Gore working with New Jersey Representatives Frank Pallone and Robert Menendez to break what participants were calling a "mud lock."

The economy of the New York-New Jersey region is often thought of as being based on brainpower rather than brawn, but a healthy greater New York is not conceivable without a viable port. Reflecting the importance of the harbor to the work of the district, as well as the need for balance, in the mid-1990s the district created a Harbor Programs Management Branch inside its Programs and Project Management Division. This branch manages the construction and maintenance of new federal navigation channels in the Port of New York and New Jersey and conducts environmental restoration and remediation in the harbor. In performing these duties the branch focuses on achieving an appropriate balance between altering, enhancing and protecting nature.

The district in these years was marked by continuity as well as change. One area of continuity lay in the synergy between military and civilian operations. The Pentagon benefits from the Corps in two main ways. It gets an engineering organization that designs and builds domestic military facilities, and it gets an organization with a wide range of domestic experience that the military can call on to support its worldwide deployments. For its part, the Corps of Engineers' organization – a civilian workforce with a regularly changing military leadership – strengthens the Army's operation in a number of ways. One of the most important benefits derives from the Corps' capability to assist in emergency and homeland security operations. For example, the experience gained by district personnel in Kosovo was applied to the design and construction of emergency field service facilities district staff worked on in Louisiana in the aftermath of Hurricane Katrina. This mutuality should continue to serve the Corps of Engineers well. In whatever new directions the American military goes during the next decades it will need new and improved facilities, which the Corps will be ready to supply.

Demand will remain for other key Corps missions besides military construction in the coming years. The navigation channels in and around the New York-New Jersey harbor will continue to need maintenance dredging. There is no reason to think that the steady growth in container ship size will suddenly be arrested. Who can say how long the fifty-foot-deep channels the district is currently excavating will be adequate? Similarly, the district's beach nourishment projects have held up better than predicted, much to everyone's satisfaction. However, eventually, replenishments, if not rebuilding, will be

MOVING THE *USS INTREPID*

As the Corps of Engineers prepares to face the challenges of the twenty-first century it expects that many more of its operations will be done jointly with partners. An opportunity to demonstrate this partnering strategy presented itself in November 2006. The decommissioned aircraft carrier USS Intrepid has been the centerpiece of the Intrepid Sea, Air & Space Museum since the museum opened in Manhattan in August 1982. Its roughly 750,000 annual visitors ranked the museum among the premier visitor attractions in greater New York. But after a quarter century as a floating museum, both the ship and its mooring at Pier 86 needed upgrades. The Intrepid Museum Foundation planned a $60-million project that involved moving the engineless ship across the harbor to Bayonne, New Jersey, where it would be repaired and renovated while the pier was rebuilt. In August 2006 the museum received a permit from the New York District to pull silt from underneath the vessel and dredge a thirty-five-foot-long access channel from the ship to the navigation channel in the Hudson River.

The move was planned to coincide with the highest tides of the year. A crowd of dignitaries that included both of New York's United States senators watched as six tugs, with four district ships in the lead, began to pull the 925-foot-long carrier stern first toward the main channel. But the ship went only a few feet before its huge propellers ran into a mound of mud that had built up rather than dispersed, as the Foundation had planned. The tugs tried for nearly an hour to move the massive vessel, but with the tide now receding the effort was abandoned, and the ship was left with its stern roughly two feet higher than its bow, its fantail deeply embedded in mud.

When officials of the museum contacted the Pentagon for help, they were directed to the New York District as the nearest federal agency with relevant expertise. When district personnel reached Pier 86 approximately two hours later they saw divers next to the huge carrier standing in just four feet of water. This problem would not be solved simply by more dredging. The district recommended that salvage experts be brought in, and the Naval Sea Systems Command was dispatched. According to district engineer Colonel Aniello Tortora, "[W]e executed this mission as a joint military operation with daily progress meetings and situation reports." The Navy brought technical expertise to the partnership; the Corps provided project oversight and integration. The team devised a plan that involved making the existing outlet to the main channel both deeper and wider; scraping sediment from under the stern with a drag bar; and vacuuming the remaining mud away, if necessary. There was no time to waste. The ship's hull was under stress due to the unusual manner it had come to rest, and if the hull plates separated petroleum-contaminated bilge water could leak into the river. Moreover, the next favorable tide was only four weeks away, and the season was approaching when salt water fish such as striped bass and winter flounder migrate into the estuary to spawn. Work in the area needed to be done before the fish arrived.

Permit decisions were expedited and work resumed a week after the Intrepid ran aground. The district coordinated the New York City agencies that were providing barges to keep empty vessels available for containing the dredged sediment. The material, fortunately for all concerned, was acceptable for beneficial use as interim cover in the closing of the Fresh Kills landfill in Staten Island.

The foundation tried to float the Intrepid again on December 6, twenty-nine days after the first attempt. It was a delicate operation. The tugs had to pull the ship from its berth at a slight angle to avoid the remaining mud, but with enough control to prevent the vessel from crashing back into the pier when it was taken by the river's current. They were successful. On the voyage downriver to Bayonne, as the Intrepid passed the World Trade Center site, former crewmembers on board unfurled a large American flag from the ship's superstructure.

*The **Gelberman** leads the **USS Intrepid** to its temporary dock in Bayonne, New Jersey, December 5, 2006* necessary. It would be unwise to predict how Congress will react to this need, but one can foresee considerable demand developing for the expenditure of federal funds on beaches within the district. The population living within the district's civil works boundaries has continued to build new homes and businesses in the floodplains. While many important flood damage reduction projects were built in the last thirty years, continued population increase suggests more will be needed. Many scientists suggest that the effect of global warming will lead not only to higher average temperatures but also to a general increase in extreme weather of various kinds. This could well create heightened demand for flood damage reduction and other water resource-related projects.

As concern for the environment has become more important to many Americans, environmental restoration now coexists with navigation, flood damage, and beach protection, as part of the Corps mission. Many Americans now find objectionable past government practices such as the draining of wetlands, damming of rivers, and anything less than the most rigorous handling of nuclear waste. Many of the corrective actions required to clean up after these practices now fall to the Corps of Engineers. Even so, while the Corps' "Environmental Operating Principles" assert a "connection between water resources, protection of environmental health, and national security," there are some who feel that the American public's support for environmentalism may be broader than it is deep. As costs mount and the economic and ecological balance becomes increasingly difficult to achieve, Congress will be called on to make hard choices. It is difficult to know how much continuing support for funding to clean up and repair and improve the environment will be forthcoming.

Not long after research for this book began, the Gulf Coast was hit by Hurricane Katrina, and large parts of the city of New Orleans were destroyed. It was a national tragedy, whose overall significance far outweighs its impact on the Corps of Engineers. But its effect on the Corps was immediate. Within weeks of the storm, those contacting the New York District had changed their vocabulary. They were asking about storm damage reduction in terms of National Weather Service hurricane categories based on wind velocity rather than inquiring about the customary odds of storm waters of a certain depth in a given year, usually expressed as twenty-year or one hundred-year storms. In early 2007 the Corps was still learning from the devastation in Katrina, but the lessons were already being incorporated into the district's coastal engineering program.

As the nation changed between 1975 and 2005, the Corps of Engineers changed with it; national priorities evolved and the Corps of Engineers adapted to them. Whether finding new and better ways to clean the environment, responding to the Global War on Terrorism, learning from Katrina, rescuing the *Intrepid*, or providing support in other areas, the Corps and its New York District can be expected to continue to show dedication and quick reflexes.

Bibliography

The sources for this book consisted primarily of published material, found in both the private and governmental sectors. The non-governmental sources consisted primarily of books, journal articles, and newspaper stories. Most of the government documents were issued by the Corps of Engineers, the vast majority by the New York District, although some came from other agencies. Formal oral history interviews made an important contribution to the research, and these were augmented by less formal conversations with dozens of district staff members and a few retirees.

Books and Articles

Because the district's boundaries include the greater New York-New Jersey metropolitan region, a megalopolis of roughly 20 million people, the amount of secondary material available is almost beyond comprehension. It is certainly beyond any one writer's ability to master – even for a study of much greater scope and depth than this. There is, of course, much more literature on New York City than on its immediate suburbs; and there is far less to read on the further outlying areas in upstate New York, eastern Long Island, and central New Jersey. From this vast panoply of material this bibliography compiles all the secondary sources that touch on the aspects of the region's history that relate to Corps of Engineers missions.

There are hundreds of local newspapers published within the district's boundaries. Few of these are indexed, and digital archives for most newspapers extend back only a few years. There was no systematic way to consult newspaper coverage of Corps of Engineers activity within the New York District, but using *Proquest Historical Newspapers*, and *LexisNexis Academic* a large number of helpful newspaper articles were seen.

Government Documents

The district has no central library or archives, having closed its library in the late 1980s during a period of fiscal constraint. It maintains a storage facility in a shed (that has no climate control) at Picatinny Arsenal, where it keeps hundreds of cubic yards of boxed material, most of it unidentified and organized merely by the time it was left at the storage shed. Many of the boxes merely contain multiple copies of district reports, but many – maybe hundreds -- appear to contain archival material. Unfortunately for the purposes of this book, and for any future researcher for that matter, the condition and lack of organization of this material precluded any effort at serious consultation. The district also has material stored at the National Archives and Records Administration storage facility in Lee's Summit, Missouri, which holds records of federal agencies and courts in New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands. It was not possible to determine by what standard the district sent items to Lee's Summit as opposed to placing them at Picatinny. The sample material requested from Kansas City turned out to be neither archival nor helpful for the project; it consisted mostly of reports by non-Corps of Engineers agencies on district-related subject matter. There is also a large collection of district publications at the Engineer Research and Development Center Library in Vicksburg, Mississippi.

Absent a central library, official district documents are scattered on several floors of the Jacob K. Javits Federal Building. At the time of writing there were four principal locations where the reconnaissance, feasibility, and limited reevaluation studies, engineering-design-documentation, after-action and other reports, and general design memoranda could be found which provided much of the project-specific data for this work. These libraries were located in the Engineering Division, the Planning Division, the Environmental Analysis Bureau, and the Programs and Projects Management Division. The majority of official Corps of Engineers publications consulted for this book, however, were found on the desks of district staff involved with the relevant projects or with related or successor projects, and were located with the generous assistance of these staff members. Unofficial planning documents and other internal source materials, including draft reports, were sometimes consulted as well. These were also gathered from the files of individual district staff members. Back issues of the *District Times*, the New York District's internal newsletter, which are kept by the Public Affairs Office, and of *Engineer Update,* the Corps of Engineer's monthly publication, proved helpful as well.

Interviews

Ten oral history interviews of New York District staff were conducted for this project, including one joint interview with retired chief of the planning division, Samuel Tosi, and retired chief of the construction division, Louis Pinata, that ran nearly a whole day. Both Tosi's and Pinata's careers spanned nearly the entire thirty-year period covered in this book, and the men provided an invaluable view of the entire course of the district's evolution in this span, including, in Tosi's case, the rise of environmental awareness among the engineers at the district. Tosi also added a lot of detail on the Passaic River tunnel plan. Pinata contributed information about Fort Drum, as well as the Superfund sites.

Frank Santomauro, Eugene Brickman, and Stuart Piken also discussed the overall evolution of the civil works side of the district in the years since the early 1980s, and they all addressed the Passaic River basin as well. Additionally, Stuart Piken recalled the flood damage reduction efforts along the Saw Mill River, planning for the Fire Island to Montauk Point beach replenishment, and the hazardous and toxic waste removal programs. Eugene Brickman shared his insights into the harbor deepening and dredged material disposal controversies, as did Frank Santomauro. Santomauro also provided detailed descriptions of the regional air team assembled during the harbor deepening project and the beach replenishment efforts along Long Island's south shore, at Shinnecock Inlet and Westhampton, and at Coney Island in Brooklyn. Eugene Brickman spoke of both Fire Island to Montauk Point and the effort in beach replenishment in coastal Monmouth County.

The interviews with James Demetriou, and Michael Rovi were primarily helpful for the military side. Demetriou clarified the district's work on the New England Strategic Air Command (SAC) bases, the Greenland projects, West Point, Fort Monmouth, and Picatinny Arsenal. Michael Rovi's interview helped with Fort Drum, West Point and Fort Monmouth. Arthur Connolly touched on West Point, Fort Monmouth and Fort Drum, but he also discussed the Secaucus postal facility. The interview with Dominick Passantino threw light on both military and civil works projects. He discussed Fort Drum, West Point, and McGuire Air Force Base, as well as the Formerly Used Sites Remediation Action Program (FUSRAP) and Superfund programs.

The interview with Leonard Houston was crucial for the Westway section. Houston was also informative on the Hackensack Meadowlands and the evolution of the district's environmental mission. Thomas Creamer and William Slezak, in their interviews, shared their deep knowledge of the district's work in the New York-New Jersey harbor, including, in Creamer's case, the drift debris disposal undertaking. Creamer also shared his perspective on the evolution of the permitting section, and he also helped clarify the organizational background to the district's response to 9/11. Slezak provided a context for the district's entire effort at coastal storm damage reduction and discussed the harbor estuary vision and the Hudson Raritan Estuary study.

All these interviews are archived at the Office of History, Headquarters, U.S. Army Corps of Engineers, and in the National Archives, Record Group 77.

In addition to the interviews conducted for this project, a number of interviews conducted by the Corps of Engineers' History Office were helpful too. These are archived in Alexandria, Virginia, and are listed separately below.

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Brian Aballo, Master of the *Haywood*. Interviewed February 7, 2002, by John Lonnquest.

Eugene Brickman, Deputy Chief, Planning Division, New York District. Interviewed January 2006, by Carissa Scarpa and Chris Ricciardi.

Arthur Connolly, Chief, Engineering Division, New York District. Interviewed January 5, 2006, by Howard Green.

Thomas Creamer, Chief, Operations Division, New York District. Interviewed April 11, 2006, by Howard Green.

Thomas Creamer, Head of Operations, Readiness and Regulatory Functions, North Atlantic Division. Interviewed February 4, 19, and 27, 2002, by Kent Sieg and John Lonnquest.

James Demetriou, Project Manager, U.S. Military Academy, West Point. Interviewed December 15, 2005, by John Lonnquest.

Alan Dorfman, Chief of the Physical Support Branch, Caven Point Marine Base. Interviewed February 7, 2002, by Kent Sieg.

Kingsley Findlay, Project Engineer, New York District. Interviewed June 3, 2002, by Kent Sieg and Eric Reinert.

Elizabeth Finn, Assistant Master of the *Gelberman*, and Richard Gaudreau Master of the *Gelberman*. Interviewed February 7, 2002, by John Lonnquest and Kent Sieg.

Leonard Houston, Chief, Environmental Analysis Branch, New York District. Interviewed December 8, 2005, by Carissa Scarpa and Howard Green.

Timothy LaFontain, Master Technical Supervisor, Floating Plants, and Edward Nerges, Deckhand. Interviewed February 7, 2002, by Kent Sieg.

David Leach, Staten Island Landfill Manager. Interviewed February 8, 2002, by Kent Sieg and John Lonnquest.

Anthony Leketa, Fort Drum Area Engineer. Interviewed March 24, 1993, by Donita Moorhus.

Colonel John O'Dowd, Commander, New York District. Interviewed February 5, 2003, by Kent Sieg and John Lonnquest.

Colonel Brian Osterndorf, Commander, New England District. Interviewed April 22 and 23, 2002, by John Lonnquest and Kent Sieg.

James Parks, Acting Chief of Construction, New York District. Interviewed February 8, 2002, by John Lonnquest and Kent Sieg.

Dominick Passantino, West Point Area Office, New York District. Interviewed December 29, 2005, by Carissa Scarpa.

Stuart Piken, Deputy District Engineer for Programs and Project Management, New York District. Interviewed November 14, 2005, by Howard Green.

Abraham Portalatin, Safety Officer, New York District. Interviewed June 5, 2002, by Kent Sieg.

Brigadier General Stephen Rhoades, Commander, North Atlantic Division. Interviewed February 6, 2002, by Kent Sieg and John Lonnquest.

Michael Rovi, Deputy Chief, Engineering Division, New York District. Interviewed December 14, 2005, by John Lonnquest.

Frank Santomauro, Chief, Planning Division, New York District. Interviewed November 16, 2005, by Howard Green.

Joseph Seebode, Chief of the Harbor Program, New York District. Interviewed February 7, 2002, by Kent Sieg.

William Slezak, Chief, New York and New Jersey Harbor Programs Branch, New York District. Interviewed December 14, 2005, by John Lonnquest.

Samuel Tosi, Chief, Planning Division, New York District (retired), and Louis Pinata, Chief, Construction Division, New York District (retired). Interviewed December 2, 2005, by Howard Green, Chris Ricciardi, and Carissa Scarpa.

John Wilbur, Maintenance Supervisor, New York District. Interviewed February 7, 2002, by Kent Sieg.

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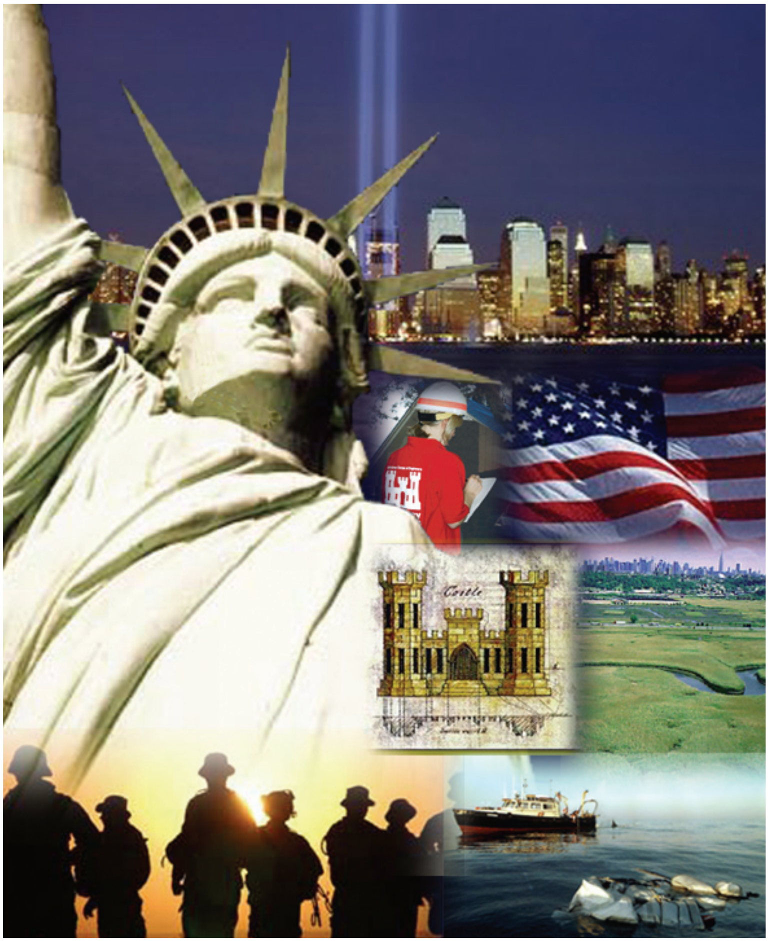

The New York District - a photo collage by
Vincent Perrera